

BROOKLYN BOTANIC GARDEN

PLANTS
&
GARDENS



1981

FLOWERING SHRUBS

THE BEST ORNAMENTALS
FOR FLOWERS, FOLIAGE, FRUIT, COLOR,
PLANTING, PRUNING, CARE

Abutilons, Hydrangeas, Camellias, Roses, Others
and Favorites, Many Collections
Choice Shrubs for All Regions



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BROOKLYN BOTANIC GARDEN RECORD

PLANTS & GARDENS

FLOWERING SHRUBS

Vol. 37

Spring (May) 1981

No. 1

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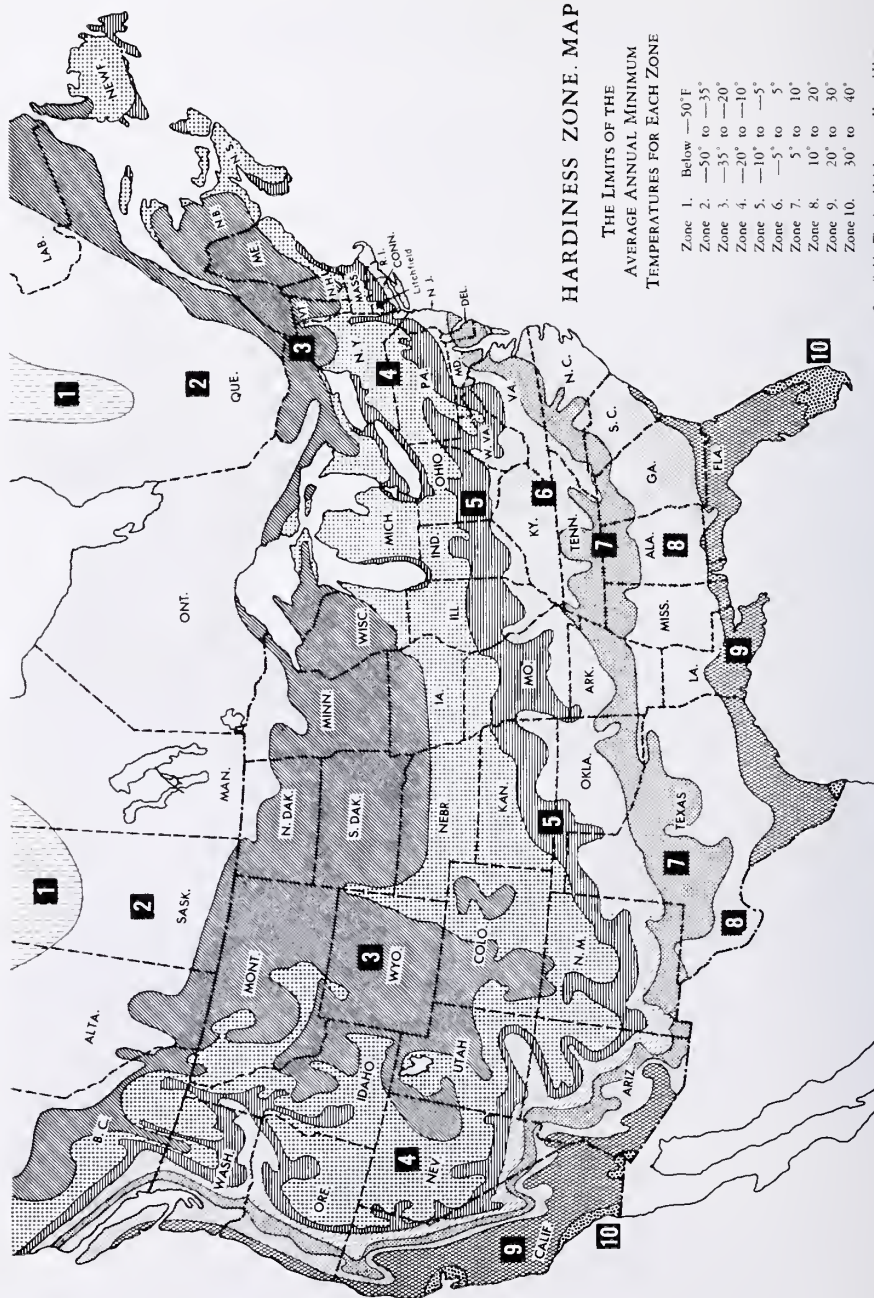
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HARDINESS ZONE MAP

THE LIMITS OF THE
AVERAGE ANNUAL MINIMUM
TEMPERATURES FOR EACH ZONE

Zone 1.	Below -50°F
Zone 2.	-50° to -35°
Zone 3.	-35° to -20°
Zone 4.	-20° to -10°
Zone 5.	-10° to -5°
Zone 6.	-5° to 5°
Zone 7.	5° to 10°
Zone 8.	10° to 20°
Zone 9.	20° to 30°
Zone 10.	30° to 40°

Compiled by The Arnold Arboretum, Harvard University

LETTER FROM THE BROOKLYN BOTANIC GARDEN

What would spring be like without forsythia, azaleas and lilacs? The spring garden is essentially a vividly colored shrub-and-bulb garden for many people, a gardener's ode to joy after the long, lean months of winter. Nowhere is the symphony greater than in the South—Callaway Gardens, Charleston, Norfolk with their electric displays of azaleas. The North doesn't do badly either, with rhododendrons, viburnums, flowering quinces and spireas. In fact, each part of the country ushers in spring with considerable brightness.

The trouble is, a lot of gardens do their blooming thing all at one time, in spring, with no follow-up in other seasons. It is like having Memorial Day, the Fourth of July and Labor Day all at one time. This is a pity because there are a fair number of shrubs that bloom in summer; others have bright autumn leaf color, attractive fruits, or distinctive winter character. Some are dwarfs, others are spreaders, a few tolerate dense shade, and occasional ones would thrive even on a gravel pit. There is at least one shrub, usually a number, for just about every purpose.

Flower color is important, but bear in mind that most shrubs are in bloom only for two or three weeks, so it is essential to select ones with other good traits if they are to give good landscape value. Beware the flowering stud which is hapless forty-nine weeks of the year!

The Botanic Garden is fortunate to have Pamela Harper as Guest Editor of this completely new edition of the *Handbook on Flowering Shrubs*. She has a wealth of experience with varied fruticose (shrubby) subjects—from abelia and heather to hydrangea and zenobia! Her enthusiasm is strong and it is bound to rub off on gardeners new and old. Many thanks to Mrs. Harper and her all-star team of contributors for bringing us up-to-date on the subject.

We asked Robert Tomson who, with various title shifts (currently Vice President for Operations), has been the BBG grounds superintendent since the early 1960s, about his favorite shrub. Horticulturists don't like to be pinned down any more than weather forecasters do, but he finally admitted a special fondness for winter-hazel (*Corylopsis sinensis*), a shrub that, outside of botanic gardens, isn't seen often. It has dainty, pale yellow, bell-shaped flowers, just as forsythia begins to bloom. Because forsythia overshadows everything when it is in flower, winter-hazel has never caught the public imagination. However, other staff members at Brooklyn have esteemed winter-hazel, including former longtime BBG Horticulturist Montague Free, who also named it *his* favorite flowering shrub. He used it for spot planting on different parts of the grounds, and it is a refreshing change from some of the more common spring bloomers.

It is not always easy to find the lesser-known shrubs, but Mrs. Harper has not been stymied in her searches. Sometimes the plants are available from small nurseries ("Mom's and Pop's") who may or may not ship and who don't hang their laurel wreath on a lamp-post. They can be located, even though there are times when the intrepid gardener feels like Sherlock Holmes.

Come visit the Brooklyn Botanic Garden this year and see a wide range of shrubs, common and uncommon but all beautiful.

Sincerely,

Frederick Mc Gourty

Editor



George Tidoumis

Japanese snowball (*Viburnum plicatum*)

SHRUBS FOR EVERYONE

Pamela Harper

There are as many ways of making a garden as there are of making a cake, and a longer list of possible ingredients. What a gardener grows will be determined in part by soil, site and climate. Only a masochist would attempt a rhododendron collection on alkaline soil, only a magician succeed in growing woodland plants in the desert. Obviously a shrub killed by frost cannot be grown in New England, and winter-flowering shrubs there would be a waste of space, though they give much pleasure where winter is short and mild. Conversely, July and August are delightful months in the Northeast, where emphasis might be placed on such late-flowering shrubs as *Hydrangea arborescens* 'Annabelle', summersweet (*Clethra alnifolia*), buttonbush (*Cephalanthus occidentalis*), rose-of-sharon (*Hibiscus syriacus*), and bottlebrush buckeye (*Aesculus parviflora*). These flower a month earlier in the Southeast where, in August, gardens and gardeners alike are apt to be taking a siesta.

A hundred shrubs of large or medium size could easily be fitted into half an acre. For smaller gardens there are

smaller shrubs. *Viburnum carlesii* grows five feet or more tall, and as wide. *V. c.* 'Compactum' is smaller and denser. *Weigela florida* with its arched branches grows to a space-consuming eight feet. Pink-flowered *W.* 'Foliis Purpuris', with purplish leaves, seldom exceeds four feet. The shrubby *Potentilla* 'Katherine Dykes' may attain six feet, silvery foliaged 'Beesiana' less than two. Most deutzias grow tall, some ungainly, but pink-flowered *Deutzia x rosea* is a compact four to five feet, and white-flowered *D. gracilis* is even lower and neatly mounded.

There are head-high barberries, but also such small ones as the yellow-flowered, evergreen *Berberis candidula*, a dense two feet, and the purple-leaved deciduous *B. thunbergii* 'Crimson Pygmy' ('*Atropurpurea Nana*').

For the rock garden or tiny city lot, there are such miniatures as *Forsythia* 'Bronxensis', yellow pea-flowered *Cytisus beanii*, *Spiraea japonica* 'Bullata', with pink flowers and dark, puckered leaves, the sun-roses (*Helianthemum*), dwarf pomegranate (*Punica granatum* 'Nana' (Zone 8), most heaths

and heathers and many rhododendrons. The prostrate yellow-flowered, needle-leaved *Hypericum lloydii* for dry soils, the meek bog-rosemary (*Andromeda*) for wet ones, and the tiny yellow-starred *Jasminum parkeri* (Zone 7/8) also should not be overlooked.

As important in determining what is grown, perhaps more so, are the temperament and interests of the gardener. Plants are the common denominator, but individual satisfaction may derive from a number of things. For some gardeners, the plants come first, grown for themselves. For others, plants are the material for creating pleasing lines, whether formal or free-flowing, or for experiment with color and texture combinations. Satisfaction may derive from growing a plant known to be difficult, and for some the competitive urge finds harmless release in being the first on the block to acquire a new plant. Advertising research has shown that "new" is the second best-selling word ("free" is the first). This urge is well catered to by a steady flow of good shrubs from nurseries, arboreta, universities and private gardeners in America and abroad. *Hibiscus syriacus* 'Diana' has larger flowers of a purer white than any other rose-of-sharon, and it does not self-sow, as some others do, to nuisance point. *Pyracantha* 'Mohave', compact and bushy, is resistant to fire blight and scab. Mrs. Meserve's "blue" hollies marry hardiness with glossy leaves. Orange, red and pink shrubby potentillas have joined the whites and yellows.

Nostalgic gardeners may want to grow what grandmother grew, and there is much to be said for this. Such old favorites as lilac, mock-orange, winter honeysuckle, smokebush, weigela and rose-of-sharon are as good and easy now as they were then, provided you live in the same vicinity as she did. If grandmother lived in New England and you have retired to Florida, you'll have to reassess the situation.

Flower arrangers may favor, as line material, the twisted hazel (*Corylus avellana* 'Contorta'), contorted willow (*Salix matsudana* 'Tortuosa'), or the Japanese fantail willow (*S. sachalinensis* 'Sekka' or 'Setsuka'), with branches flattened, fasciated and curved. *Leucothoe fontanesiana* 'Rain-

bow' is favored for foliage, and *Dipelta floribunda*, though scarce, for flower.

The number of letters asking "where can I buy it?" suggests that the sleuth is not a well developed entity among American gardeners. The search can be frustrating, but persistence pays off. It is very rewarding to run to earth such rarities as *Adina*, *Illicium*, *Zenobia* and *Befaria*. There is no all-embracing way of finding what you seek. Many plants readily available in one area are nonexistent elsewhere. A network of friends around the country, willing to buy and ship, is a definite asset. With shrubs, however, Brooklyn Botanic Garden has played Sherlock Holmes on our behalf. Its *Nursery Source Guide* describes twelve hundred trees and shrubs, with retail and wholesale nursery sources. (See back cover for how to order it and other handbooks.)

The frustrated gardener and, next-of-kin, the impatient gardener, are all-too-common phenomena. To them, the perfect shrub would be one which grew a foot a day until the desired height was reached, then stopped. There isn't one. Unlike easy-come, quickly-go annuals, however, a shrub once established may be with you for life. Slow-growing shrubs (often described as "choice") are apt to be the most rewarding in the long run, but transient gardeners, and many new ones, seek quick results. This is possible, inexpensively, with such sturdy, quick-growing things as *Forsythia*, *Weigela*, *Spiraea*, rose-of-sharon, mock-orange, *Kerria* and many viburnums. Some may grow too fast. Those who follow after will not bless you if you have planted, especially on sand, such stoloniferous shrubs as hardhack (*Spiraea tomentosa*), *Rhus typhina* and most bamboos. Southerners should also be wary of *Clerodendrum* and *Wisteria*. But the handicap of transience can be turned to advantage. The wanderer has a better chance than most to study native flora and visit gardens and arboreta. Obtain a copy of the BBG Handbook *American Gardens—A Traveler's Guide*. Take up photography. Build a store of knowledge to draw upon when the time comes—perhaps in retirement—to actually dig in the soil. ❀

WHAT IS A SHRUB?

The dictionary says "a low woody plant with little or no trunk," but it isn't quite that simple. Common sage (*Salvia officinalis*) retains a woody framework in mild climates, dies to the ground each winter in cold ones. Russian-sage (*Perovskia atriplicifolia*), dwarf pomegranate (*Punica granatum* 'Nana'), bluebeard (*Caryopteris* \times *clandonensis*) and such indigos as *Indigofera decora* are other examples of die-back shrubs or sub-shrubs. Butterfly-bush (*Buddleia davidii*) is a dieback shrub in the North, and even in the South may be best treated as such and pruned back almost to ground level in March.

Such hedging shrubs as cherry-laurel (*Prunus laurocerasus*) and privets (*Ligustrum vulgare*, *L. ovalifolium*, *L. lucidum*) become small trees if left unpruned. In the warmer zones chaste-tree (*Vitex agnus-castus*) grows gnarled and treelike, while marbled crape-myrtle (*Lagerstroemia indica*) trunks of two-foot girth are not uncommon. In Zone 7 winter cold keeps both of them multi-stemmed and bushy. *Wisteria*, by nature a twining vine, can be trained into a shrub, but such manipulative practices (espaliering, too) are labor intensive—you can never let up. Some shrubs, often termed scandent, are semi-vining; winter jasmine (*J. nudiflorum*) is one, goldflame honeysuckle (*L. \times heckrottii*) another. Let them sprawl or keep them pruned as shrubs. The choice is yours.

Some plants, not shrubs at all, are used as such. Pampas grass (*Cortaderia selloana*) is a grass, but it has the height and bushiness of a shrub, as do some bamboos. Flowering crabapples are trees, but the trunk of *Malus sargentii* is so short, the branches so wide-spreading, that for practical purposes it can be regarded as a shrub. Most flowering cherries, almonds and apricots are trees, but not all. The Chinese dwarf almond (*Prunus glandulosa*) has wands of tiny pink roselike flowers in early spring on a bushy shrub seldom more than three feet high. Dwarf Russian almond (*Prunus tenella*) grows a bit taller, the single flowers bright pink, almost red, or, in *P. t.* 'Alba', white.

Catalogs often group shrubs as deciduous, broad-leaved evergreens, or needle evergreens or conifers. Conifers lack showy flowers in our sense of the term and are not our subject here. The term broad-leaved evergreen includes everything else, and the leaves may, in fact, be narrow, even needlelike, as in heaths, rosemary, lavender and *Grevillea*. Some shrubs, *Viburnum* \times *burkwoodii* for one, are semi-evergreen. This means that whether they shed some, all or none of their leaves in winter depends upon how cold it gets. Evergreen leaves may be gray, yellow, purple or variegated, as well as green. They are not, as sometimes supposed, everlasting. A proportion of them are shed each year, so do not conclude when you find some dead leaves on an evergreen shrub that it is sick or dying.

Accepting that none of us can grow more than a fraction of the shrubs available to us, how do we choose? What makes a good shrub? In *Shrubs and Trees for the Small Place*, published in 1943, P. J. Van Melle scored several hundred shrubs for floral effect, fragrance, foliage value (seasonal and year-round), decorative fruit, summer blending value, winter value, relative freedom from insects and diseases, transplantability, tolerance of light shade, and adaptability to various soils. Only shrubs hardy in Poughkeepsie, New York, were considered, and obviously the list would be very different in warmer zones. Out of a possible 100, rather few shrubs scored more than 70. Of those scoring highest *Berberis thunbergii*, *Abelia* \times *grandiflora*, winged euonymus (*Euonymus alata* 'Compacta'), *Rosa hugonis*, doublefile viburnum (*V. plicatum tomentosum*), and Persian lilac (*Syringa persica*) are as highly regarded today.

In the planting of a garden many things must be considered, with time, energy and money not the least of them. But start from these considerations and you will be on the right track. There is only one good reason for growing any ornamental plant—that it gives you pleasure. If it doesn't, chuck it out, though it has every other good quality. ♣



Forsythia trained as standards

USING SHRUBS IMAGINATIVELY

Nicholas Nickou and Pamela Harper

An interesting collection of plants need not degenerate into a museum. An amateur who works in his own garden will have in mind that a plant should surely be put where it is most likely to thrive, and the choice of position should not be embarrassed by having to consider too deeply how it will fit into a scheme. It does not follow that this consideration will be ignored . . . if a little imagination is exercised, there will be few distressing results.

Sir Arthur Hort, *Garden Variety*

Shrubs dotted about in a lawn may survive but not thrive. This type of planting also constructs an obstacle course for the person who mows the lawn. Children on



With lower branches removed peegee hydrangea (*H. paniculata* 'Grandiflora') cascades over a stone wall.

bicycles may welcome it, but the health of the shrub is not thereby improved. Dogs view the solitary shrub as the next best thing to a mailbox, and such shrubs, whether they need it or not, will get a share of the water, fertilizer and weedkiller applied to the lawn, while preventing grass from encroaching on shrub roots will be an unremitting chore. Aesthetically, the opportunity is lost for creating pleasing combinations, whether of mixed shrubs, or shrubs in association with small trees, perennials, vines, ground covers and bulbs.

The straight row of forsythia or van-houtte spirea makes a spectacular hedge in spring, but deciduous shrubs usually do not eliminate an undesirable view in winter. A row of hemlocks gives twelve months of service, but one needs a large property to accommodate such a hedge, and the work to keep it sheared is awesome. On the other hand, an irregularly

planted mixture of trees and shrubs, deciduous and evergreen, performs a multiplicity of services. A strategically placed conifer—perhaps a hemlock or red cedar—can eliminate an objectionable view, at the same time providing a dark background against which the yellow flowers of Chinese witch-hazel (*Hamamelis mollis*) stand out in January and February. A low-growing shrub can designate a property edge while still allowing one to view the neighbor's flowering cherry. Thus, each member of this "hedge" will perform a number of duties in addition to displaying its own attributes.

Visiting other gardens, public and private, helps build a memory bank or recorded list of complementary plant combinations and effective placement. A garden should reflect the creator's personality, with soil and climate taken into account. In making a few suggestions from

our own experience and observations, the aim is to stimulate your individual creativity.

Sites

When placing shrubs consider their tendency to face the sun, presenting the best flowers and/or most brightly colored foliage on the sunny side. No sun comes from the north, and high-in-the-sky mid-day sun is seldom flattering. Shrubs facing east or southeast will be front lit in the morning, those facing west in late after-

noon. The red stems of Siberian dogwood (*Cornus alba* 'Sibirica'), or the more patrician coral-bark maple, *Acer palmatum* 'Senkaki' ('Sangokaku') need front lighting, as do most plants producing red berries, but the translucent red thorns of *Rosa omeiensis* (*sericea*) *pteracantha*, or the heart-shaped, ruby red fall leaves of *Disanthus cercidifolius* (a "collector's" shrub from Japan) lit from behind are comparable to claret held up to the light. Purple-leaved smokebush (*Cotinus coggygia* 'Purpureus') has the same translu-

Roche



Formally clipped yews and casually pruned azaleas and rhododendrons give a variety of heights for the eye to light upon in the understory before the trees are viewed.



To extend the period of color, virgin's bower (*Clematis virginiana*) a vigorous summer-flowering vine, is allowed to ramble over shrubs whose bloom season has passed.

cent glow against the westerly sun. Side lighting is often effective, particularly so for the silvery catkins of the pussy willows, or the black ones, opening with red and yellow stamens, of *Salix melanostachys*.

Shrubs with flowers along the tops of the branches are showiest viewed from above. Doublefile viburnum (*Viburnum plicatum tomentosum*) is handsome in almost any position, but spectacular seen

from a second story window facing the south side of the shrub. Looking up into some other shrubs may be more rewarding, particularly those with belllike flowers. The pendulous flowers of *Magnolia sieboldii*, with their red clubs of anthers, are striking when viewed from below, and a king-of-the-castle position atop a bank displays to advantage the drooping tip clusters of slender silky-haired yellow flowers borne early in the year by the

paper-bush (*Edgeworthia papyrifera*), a Japanese shrub that has become naturalized in parts of the South.

Fragrant-spice viburnum (*V. carlesii*) is often planted near a window, so that the fragrance will be wafted into the house. *V. x burkwoodii* is almost as fragrant and has glossier foliage that is evergreen in the South, persisting well into winter in the North. It also grows considerably taller. A plant hanging over a short walk near a patio perfumes the house and anoints the patio and the person walking beneath. Sweet pepperbush (*Clethra alnifolia*) also has wonderfully fragrant flowers and, in both pink and white forms, is a grand summer flowering shrub. When in bloom, however, it attracts hosts of bees, so protect walkers by planting low shrubs near the path with the *Clethra* rising up behind.

The preference of *Clematis* for cool, shaded roots makes them good companions for shrubs. Planted on the north or east side, they will ramble through to flower on the sunny south or west facing side. Give a thought to size. *C. montana* will make its way to the top of a tall tree. At the other extreme the dainty *C. macropetala*, native *C. texensis* (red) or *C. crispa* (blue) are restrained enough to be trusted on quite small shrubs, even azaleas. Azaleas must have acid soil, and it is often said that clematis must have lime, but this is not so. Most of the large-flowered hybrid clematis are of intermediate size, and pyracanthas and viburnums make good hosts for these. *Viburnum farreri* flowers fragrantly in winter or early spring but is undistinguished thereafter. *Clematis* 'Ramona' is rambling though it gives late spring flowers to match the blue of nearby *Iris sibirica*.

Pleasing Companions

For early spring a favorite flower color combination is star magnolia (white), *Rhododendron mucronulatum* (mauve) and forsythia (yellow). If they are separate but close enough to be picked up in a single field of view or in a short scan of vision, the effect is more subtle and artistic than if they are planted side by side. For greater versatility substitute 'P.J.M.' rhododendron, the foliage of which turns

mahogany in winter, for the deciduous *Rhododendron mucronulatum*. The single-flowered *Kerria japonica*, more graceful than the better-known double form, could take the place of forsythia. So could winter-hazel (*Corylopsis*), with a taller species such as *C. sinensis* behind the rhododendron, or the comparatively low-growing *C. pauciflora* towards the front. Later in spring a similar white, mauve and yellow combination could be contrived with *Rhododendron carolinianum* or 'Windbeam', white Japanese azaleas, and the Warminster broom (*Cytisus x praecox*). In warmer gardens (Zone 8) the creamy yellow of the broom could be echoed by the myriad small pom-poms of the yellow Lady Banks rose (*Rosa banksiae* 'Lutea'), the nearly thornless canes trained up into a tree.

Kerria japonica 'Picta' plays a dual part in yet another white, yellow and mauve combination. This is a variegated shrub of exceptional charm, the flowers single, the delicate tracery of branches clad in spear-shaped, soft green leaves with a narrow edging of white. The supporting role is played by an uncommon azalea, 'Koromo-shikibu', with mauve spidery flowers reminiscent of *Cleome*.

The shrubby dogwoods grown for their variegated foliage can be very attractive if displayed with care. A midsummer combination in one New England garden consists of *Cornus alba* 'Elegantissima', each oval, sharply pointed leaf white with a feathery green center, the cotton candy "smoke" of *Cotinus coggygria* 'Purpureus', and the large, snowy inflorescences of *Hydrangea arborescens* 'Annabelle'. Elsewhere *Spiraea x bumalda* 'Anthony Waterer' takes the place of the hydrangea in a similar combination. All four would be better still. *Spiraea x bumalda* 'Crispa' (often marketed as 'Dolchica') resembles 'Anthony Waterer', with the bonus of leaves that are elegantly incised. In southern gardens the white leaf margins of *Cornus alba* 'Elegantissima' sometimes scorch in the sun, in which case the white variegated, evergreen holly-leaved *Osmanthus heterophyllus* 'Variegatus' could be used instead.

In autumn the mellow gold foliage of

golden-larch (*Pseudolarix amabilis*) is complemented by the red berries of an outstanding holly, *Ilex x aquipernyi* 'San Jose', underplanted with the blue mistflower or hardy ageratum (*Eupatorium coelestinum*), a combination recommended with the warning that in moist, sandy soil mistflower spreads very rapidly.

There are many ways of using the same shrub. Left unpruned, *Cornus alba* 'Elegantissima' grows large and loosely rounded. In one Connecticut garden it is pruned severely in early spring to make a small patch of white and green foliage in a border of brightly colored perennials. Winter twig color is enhanced by this hard pruning.

The Mixed Border

One of the most visually pleasing ways of growing shrubs, and well suited to the suburban quarter-acre, is in the mixed

border. Towards the back go a few small flowering trees—cherries, perhaps, crabapples or plums, then a mixture of evergreen and deciduous shrubs. In bays between the shrubs go such perennials as *Hosta*, *Bergenia*, *Dicentra*, *Pulmonaria* and hellebores, with such taller bulbs as lilies and daffodils, and maybe a few ferns. Low creeping plants and small bulbs go at the front, perhaps partridgeberry and hardy cyclamen in a shady border, or creeping phlox and crocuses for those facing south or west.

In the mixed border shrubs usually predominate, but many sun-needing shrubs may be better placed in a border or island bed planted primarily with perennials. Where winters are not severe, *Cistus*, rosemary and lavender are at home in such a setting, as are those sub-shrubby plants that retain a woody framework in warm climates but die to the base each winter in cold ones.

Roche



To both lead the eye yet give a measure of privacy, *Deutzia x lemoinei* is planted by a gatepost. Porch plantings include convex-leaved Japanese holly, clematis and dwarf rhododendron.

Orange-eye butterfly-bush (*Buddleia davidii*) comes to mind, also the yellow-flowered *Buddleia x weyerana* 'Sungold'. Such herbs as common sage (*Salvia officinalis*) and its cultivars 'Icterina' (leaves green and gold), 'Purpurascens' (purple), and 'Tricolor' (gray-green, white, purple and pink) fit in well, as does blue rue (*Ruta graveolens*, especially the clone 'Jackman's Blue'). Then there are such small gray-foliaged shrubs as *Senecio greyi*, artemisias, lavender-cotton (*Santolina chamaecyparissus*), curry-scented *Helichrysum serotinum*, blue *Caryopteris* and summer-blooming Russian-sage (*Perovskia*) with its spires of smoky mauve flowers. A hardy fuchsia, *F. magellanica* 'Versicolor', grown as far north as coastal New England for its subtly blended pink, gray-green and white foliage, looks equally well here and in the shrub border. Taller gray-leaved shrubs for sunny borders are *Buddleia alternifolia* 'Argentea', with arching branches bearing massed mauve flowers in spring, and the chaste-tree (*Vitex agnus-castus*), which blooms in summer (both may make small trees in warmer gardens). In the North the chaste-tree may be killed back in winter, in which event it flowers on the current year's growth in late summer. The flowers are violet blue, or white in the cultivars 'Alba' and 'Silver Spires'.

No shrub is put to more varied use by artistic gardeners than the purple-leaved forms of smokebush (*Cotinus coggrygia*), used as background for almost any other color, even, by the bold, with orange. Whether or not such a combination constitutes a color clash is a controversial topic. What matters is—does it please you? A sophisticated version of the mixed border is the red and purple border, one much-photographed example being that at Hidcote, an English National Trust garden. Purple smokebush is never more dramatic than when used with pure red, as exemplified by beebalm (*Monarda didyma*), cardinal flower (*Lobelia cardinalis*), and the ruby-red stems of rhubarb chard. Second place among shrubs for such borders goes to red-leaved Japanese barberry (*Berberis thunbergii* 'Atropurpurea'), its diminutive 'Crimson Pygmy', or to *B. t.* 'Rose

Glow', which has a dappling of rosy pink over the dark leaves. Other possibilities include Japanese maple, *Weigela florida* 'Foliis Purpuriis' (lower growing than most weigelas), purple-leaved filbert (*Corylus maxima* 'Purpurea') and purple-leaved sand cherry (*Prunus x cistena*). City dwellers should note that such shrubs look well with a brownstone background.

Other Combinations

That nature's colors never clash is an oft-heard statement, and as often refuted. Perhaps not, when nature does the planting. In a moist area it has created a fall panorama with the purple foliage of black ash, the red fruit of winterberry (*Ilex verticillata*), the yellow leaves of sweet pepperbush, a dab here and there of the orange leaves of poison sumac, and a scattering of blue asters. Add some brown-clubbed cattails and the plumes of distant reed grass (*Phragmites*) and the show can be overwhelming. But nature did not plant the bright pink fall-blooming sasanqua camellias at war with red-berried pyracantha in many southern gardens. White sasanquas could be used. Or even better, emulate Norfolk Botanical Garden in Virginia where, reflected in water, grow white sasanquas fronted by the brilliant red fall foliage of *Euonymus alata* 'Compacta', a scene somehow both serene and stimulating.

Good but hackneyed shrubs can, with imagination, take on new dimensions. Try plain old tawny daylilies with hills-of-snow hydrangea (*Hydrangea arborescens* 'Grandiflora'), or an underplanting of the rapidly spreading, raspberry pink-plumed *Astilbe chinensis* 'Pumila' with the peegee hydrangea (*H. paniculata* 'Grandiflora').

When deciding where to put a shrub bear in mind that some make tight, compact balls or mats of roots which hold the soil, others make fewer roots that go deep into the earth or roam far afield near the surface. The first kind, azaleas and rhododendrons for instance, can be transplanted until they get too big to lift. Some of the others, especially brooms and pyracantha, are unforgiving if moved once they have made themselves at home. ❀



Palibin lilac

Little room? Then choose plants tailored for your garden . . .

FLOWERING SHRUBS FOR LIMITED SPACES

James E. Cross

There are many dwarf and slow-growing shrubs suitable for the small garden, patio, balcony or container plantings. An increasing number of such plants can be located with a bit of searching, either at garden centers or through mail-order nurseries. Several publications help both in learning what is available and in making selections for a particular location. These include such Handbooks in the BBG series as *Rhododendrons and Their Relatives* and *Nursery Source Guide* (which has a special section on dwarf shrubs), *Dwarf Shrubs* by Donald Wyman (Macmillan), *Ground Cover Plants* by Donald Wyman (Macmillan), and *Dwarf Rhododendrons* by Peter A. Cox (Mac-

millan). There is also *Dwarf Shrubs for the Midwest* by R.M. Keith and F.A. Giles (University of Illinois at Urbana-Champaign).

From the wide range available a few particularly useful plants have been picked out for comment.

Diminutives of Old Standbys

For persons living in regions which do not experience cold below -15°F , and for a reasonably wide range of soil conditions, an old garden standby offers us a fine dwarf under the name *Spiraea japonica* 'Alpina'. In ten to twelve years, in only moderately fertile soil, this plant will become a neat, low dense mound two feet

high and three times as wide. The many clusters of rose-pink flowers arrive in June and hold into July. Another cultivar, 'Little Princess', is similar but more vigorous, with flowers of a darker shade. Both lose their leaves in autumn. Spireas thrive in full sun but are also satisfactory in part shade. Apart from some cleaning in spring, removing winter-damaged wood and leaves caught among the twigs, this plant should be trouble-free in most locations.

Another well known shrub of broad geographic usefulness is the common lilac (*Syringa vulgaris*), the lilac of many old gardens. Because of the substantial space it needs, it has been superseded in small gardens by a relative dwarf, *Syringa meyeri* 'Palibin' (at various times also known as *palibiniana*, *velutina* and *patula*). This much slower-growing lilac from Korea produces a heavy stand of mildly fragrant, lilac-colored flowers in the latter part of lilac season. Although 'Palibin' can attain as much as seven feet in height in twenty-five years, it is seldom seen much over three feet, though usually almost twice as wide. It seems immune to the powdery mildew so common to lilacs in late summer.

Forsythia, noted for its very early yellow flowers, can be grown, by using dwarf forms, in much less space than that required for the large species and hybrids. 'Arnold's Dwarf' is a low, rambling cultivar employed mainly as a soil-holding cover for sharp slopes. It does not usually flower abundantly enough to be ornamental. *Forsythia viridissima* 'Bronxensis', on the other hand, is a good producer of distinct yellow flowers and remains quite dwarf, in ten to twelve years reaching not much beyond one foot in height and twice as wide. It can be used in a low shrub border or as a framing plant at the edge of a rock. Like most other forsythias, the flower buds are damaged when temperatures dip near -10°F , but the dwarf forms are more fully protected where snow cover can be relied upon.

Some Evergreens

There are two shade-tolerant ground-covers which should be used in more gardens. The first, *Sarcococca humilis* (often

sold as *S. hookeriana humilis*), should not be planted where it has full sun for more than one-third of the day (or half the day if it is morning sun). Like pachysandra, it loses much of its luster and color in full sun. Nor should it be used in those climates with winter lows (without snow cover) much below -5°F . The evergreen foliage resembles that of *Skimmia*, with long, shiny narrow leaves, but its habit is to spread, staying under one foot in height. The common name of sweet-box is well demonstrated when, on a quiet sunny day in very early spring, one approaches a planting and finds the air filled with the first fragrance, with no flowers easily to be seen. The black berries are quite evident later in spring.

Sarcococca spreads underground by stolons, not uncommonly breaking the soil two or three feet from the plant's center, leaving the intervening space to be filled in the following year. It benefits from a heavy mulch, and from an application of lime on very acid soils.

A delightful ornamental evergreen ground cover which, though tolerant of full sun in some areas, is a better performer in part shade is *Vaccinium vitis-idaea minus*, our native mountain cranberry. It is winter hardy anywhere in the United States where soils are well drained and acid, but it does not thrive where summers are hot and dry. The pink and white grapelike clusters of flowers are followed by prominent red fruit (tart but used in jellies and sauces). The foliage, extending up only a few inches, is always attractive, but particularly so in the fall. Because mountain cranberry spreads by stolons immediately beneath the soil surface, a heavy mulch encourages rapid spreading and filling-in by moderating the extremes of moisture and temperature in the stolon run. The European version, *Vaccinium vitis-idaea*, known as lingonberry or cowberry, grows nine to twelve inches high with larger leaves, but is not as cold-tolerant.

A fine dwarf of a stature well-suited to the rock garden, otherwise needing mass planting for effect, is the evergreen candytuft usually sold under the name *Iberis sempervirens* 'Pygmaea' ('Little Gem'). This provides a clear white flower

for the early spring garden and a low, neat mound of green (not evergreen much below 0°F) the rest of the year. Unlike the taller-growing species, it does not seem to need an annual post-flowering shearing to stay neat and tidy.

Stephanandra, *Daphne*

A distinctly different deciduous plant of low stature and hardy to about -20°F is *Stephanandra incisa* 'Crispa'. This makes a dense and twiggy one- to two-foot mound of crisply textured, light green foliage. Abundant white flowers in early summer do not provide enough contrast with the pale foliage to be very noticeable. However, it is excellent as a single plant or grouped as a ground cover. *Stephanandra* tolerates poor soil, and it has been claimed that it will even survive the shade and root competition of maple and beech trees. In view of the lack of alternatives, this should be worth a try. If the soil is acid, an application of ground limestone will result in a lusher, more vigorous plant. Like all members of the large Rose Family (*Rosaceae*), it presumably would be vulnerable to fire blight under the right conditions.

The genus *Daphne* provides us with a selection of delightful, very fragrant flowering plants, both evergreen and deciduous, of varying shape and stature. Most if not all are exacting in their cultural demands. Just what their needs are will be forever debated by avid gardeners, but extra sharp drainage around and beneath their roots (sandy soil on a steep bank, or behind a rock wall would be good) is certainly one requirement. It helps to add a bit of lime to acid soil when planting. Once they are fully established leave the plants alone, preferably *not* under automatic irrigation, and *not* subject to regular chemical treatments to foliage or soil.

Daphne cneorum, the garland flower, is the hardiest and perhaps best known of this genus, but also the least-willing to tolerate too much water around its roots. Its exceptionally fragrant pink flowers on a low spreading plant make the risk of loss worth taking. The selection 'Eximia' is to be preferred, because it is noticeably less fussy and tends to retain its foliage all along its stems, which makes it far more

attractive and useful as a year-round ground-cover. 'Variegata' and the difficult-to-find 'Pygmaea Alba' also seem less contrary than the species.

Another beautiful evergreen daphne, but subject to winter damage below 5°F, is *D. collina*, with fragrant rose-purple flowers and an eventual height of a bit over two feet. Probably the best of the lot but seldom available commercially is *Daphne arbuscula*, a neat slow-growing evergreen with dark green leaves, rose-pink flowers that bloom sporadically through the summer months and an almost flawless growth habit. It is also a candidate for the rock garden because of its very slow rate of growth.

Brooms

Of particular interest to those gardeners with very light, sandy soil (including the near-pure sand of the dunes along the seashore) is the group of plants commonly known as "brooms" (*Cytisus* and *Genista*). They are never long lived, and rarely last more than five to seven years in rich, fertile garden soil, where they grow top-heavy and cannot withstand strong winter winds. The lower-growing species do not suffer in the same way from the wind and have longer useful lives provided winter temperatures stay above -5°F and the roots are able to go deep, as is true of all legumes. Brooms take hold better and remain more vigorous if lime is added to particularly acid soils. The pealike flowers, borne in profusion at the tail-end of spring's main bloom period, make a major contribution in color, timing and form of presentation.

Cytisus decumbens, with a completely prostrate habit and bright gold flowers, is a useful addition to the rockery or wall planting, especially in sunny, open areas. *Genista lydia* is a low (under one foot) mounding or weeping delight of many golden yellow flowers, a nice addition to almost any light-soil garden where the temperature remains above 0°F. *Genista sagittalis* cannot compete as an ornamental in the average inland garden but is an excellent retainer of wind-blown sand behind the first dune line and, at flowering time (late May-early June in New York), is most impressive.

Cytisus x kewensis appears to be the most versatile and least fussy of the lower-growing brooms. It has the classic broom appearance of green stems and cream-to-yellow flowers but usually stays below one foot in height with distinctly horizontal lines and a rate of growth which keeps it within reasonable bounds for many years.

Just as many gardeners find their space limited, the space for these comments is too limited to permit coverage of the many other fine dwarf flowering shrubs. For those interested in studying the subject further, a visit to botanic gardens and arboreta can be of real help, as can reference to publications such as those mentioned on p. 79. ❧

WHEN AND WHEN NOT TO LIME

Liming the soil seems, for some, to be almost a religious rite. Before you do it, know what you are about.

Walk over a piece of land after a rain and you will know if it is squishy and waterlogged. Digging in a fork will tell you whether it is sandy, clay, stony or (oh, so rare) a rich loam. What you cannot see or feel, and may not know that you need to know, is the pH of the soil, a symbol used to indicate relative degrees of acidity or alkalinity. For example, pH7 is neutral, numbers below it progressively acid, those above it progressively alkaline. The numbers are logarithmic, so 6 is more acid than 7 and 5 is much more acid, not just twice as acid as 7. Many vegetables, and a few ornamentals (lilac, for example) prefer a slightly alkaline soil, but a far greater number must have it acid. Fortunately, most of the shrubs we grow tolerate what they can get.

A low pH can be brought up by adding lime, sometimes referred to as "sweetening" the soil. Lime also helps break down clay and is sometimes added for this purpose, but lime spells death for some ornamentals. The physical condition of the soil, whether clay or sand, is best improved by adding bulky, humus-forming materials such as leaf-mold, peat, compost and manure. This takes time and effort, but Rome wasn't built in a day, nor are gardens.

Lowering the pH is not easy. It can be done by adding powdered sulphur or aluminum sulphate (toxic to some plants) but the cost is high, the effect not permanent. If your garden does not offer the soil of its choice to the shrub of your choice, don't insist. Choose something else.

With a soil pH between 5 and 6.5 most shrubs will grow well, but at the higher number add plenty of an acid grade of peat for acid-soil plants, and use mulches with an acid reaction, such as pine needles. Some fertilizers have an acid or neutral reaction (ammonium phosphate, bloodmeal, cottonseed meal, composted poultry manure). Others (wood ash, bonemeal, phosphate rock) render the soil slightly more alkaline.

Foremost among calcifugous plants (think of them as fugitives from calcium, or lime) are those of the *Ericaceae* or Heath Family, few of which can be grown on alkaline soil. Most to be regretted if your soil is alkaline are rhododendrons and azaleas, although there are a few exceptions. The natural habitat of the dwarf *Rhododendron hirsutum* is the limestone rock of the European Alps. Strawberry-tree (*Arbutus unedo*) is another member of the *Ericaceae* which is lime tolerant. Where azaleas will not grow substitute the equally colorful and floriferous *Chaenomeles* (cydonia, quince), not evergreen, but lime tolerant. Where the choice *Skimmia reevesiana* won't flourish, *Skimmia japonica* may be substituted.

So many native American plants need acid soil that the term "American plants" came to denote, to English gardeners, those intolerant of lime, among them the sweet-fern (*Comptonia*), *Fothergilla*, *Clethra*, bayberry (*Myrica*), *Cyrilla*, and some species of *Amelanchier*. ❧



Herman Gauthier

PLANTING AND PRUNING

W. George Waters

According to John Evelyn, the seventeenth-century diarist, "one hundred seventy nine million one thousand and sixty different sorts of earths" have been "reckoned up by theorists." No one today would attempt the sum, but all will agree that there is a great variety of soils. There are also many different climates in which gardens are made, and thousands of plants that may be chosen for them. In the face of the permutations possible among soil, climate and plants, no simple set of instructions is possible for consigning plants to soil. Pedants attempt formulas; as many others contradict them.

Those who read instructions, then put plants in the ground and turn their backs on them, will not be gardeners. Pleasure and success come from watching the response of plants to the treatment given them. The tendency of roots to seek soil that is well aerated will teach watchful gardeners the folly of planting too deeply, where air in the soil is scarce. They will have seen how roots proliferate in the cool moist soil beneath a blanket of leaves, and thus know the value of mulch-

ing. Wisdom gained in the garden makes the gardener, but reading provokes further observation. I hope to raise questions, the answers to which can be found among the plants in your garden.

A planting hole seldom serves the plant contained in it beyond a few seasons. When roots fill the pocket of loose soil, further growth depends on penetrating the enclosing wall of undug soil. If the soil is sandy and open, root spread may continue unchecked, but if it is clayey and heavy, penetration may be hampered or prevented. The wall, glazed and compacted from digging the hole, could deter even roots otherwise happy in a clay soil.

In unplanted areas, perhaps gardens in new subdivisions on pasture, all the ground, or all that ground allocated to trees and shrubs, will need deep digging and the soil will then be disturbed throughout and be of more uniform consistency. Roots of trees and shrubs planted there are unlikely to find barriers at the perimeters of their planting holes. However, among the occupants of mature gardens in long-established lawns, newcomers need special attention.

Possible Water Problems

Roots in holes made in compacted soil are threatened also by a dearth or an abundance of water. On one hand, holes dug for plants may act as drains for water from surrounding soil. On the other hand, the surface tension of water may prevent it from moving from the surrounding soil into the finer prepared soil near the roots.

The possibility of planting holes becoming water sumps can be checked by observing trial holes during heavy rains. If they fill quickly and empty slowly, roots in them would suffocate. A drainage channel or pipe can be put in to carry water to lower ground, but breaking up the subsoil may be enough. Effects from surface tension are inclined to be greatest when the plant in the hole is from a nursery container. Nurserymen grow some plants in mixtures containing great amounts of peat. Peat, once dry, is difficult to wet. Newly acquired plants, especially evergreen azaleas, some of which are grown in pure peat, suffer terribly when dropped into holes in the soil, then water from above is shed by the leaves onto soil beyond the roots. Water intended for the roots also may be prevented from reaching them because the peat in which they are enclosed has lost too much moisture and presents an unwettable barrier to water seeping through the soil.

Teasing some of the lower roots out of the peat to make close contact with the soil will help avoid this localized drought. Some recommend making three or four vertical knife-cuts, about one-half-inch deep, into the mass of peat and roots. This form of pruning, it is said, stimulates roots and encourages them to explore the new soil. Also remember that the peat must be thoroughly moistened before planting.

All but the smallest deciduous trees and shrubs ordered by mail are shipped without soil on the roots. (Nurserymen call them bare-root plants.) They are lifted from the ground while dormant and packed to survive the journey with a minimum of damage. Frozen or wet garden soil may prevent immediate planting on arrival and they must be kept cool, but not frozen, until planting is possible. The

waiting period, added to the time in transit, subjects plants to the risk of desiccation. Roots soaked in water for an hour or two on arrival, and again just before planting, have a better start in life. Between soakings, replace the plants in the nursery's wrapping or wrap the roots loosely in moist burlap.

It may not be possible to dig the ground beyond, but planting holes should be large enough to allow roots to be spread outwards and downwards in a natural manner. Cut off bruised and broken roots. If done neatly, pruning will encourage new roots, just as branch pruning promotes new growth above-ground.

The soil line on the stem is often hard to recognize and the usual advice to "plant at the depth at which it grew in the nursery" cannot be followed. It is more useful to remember that the transition from stem to roots always begins just below soil surface. When the point at which roots divide from stem is no more than an inch or two below ground, roots are able to make full use of the spongy and well aerated top few inches of soil.

Preparing a Good Root Environment

When it is not possible to cultivate soil sufficiently far beyond the planting hole to provide uniform soil conditions, expedients such as the oversize hole are employed. The object is to provide a zone of soil intermediate in texture between that of the nursery container and that in which the roots are expected to grow. The method involves refilling the hole with soil taken from the hole then mixed with finer stuff, usually from a bag. The transitional zone is supposed to encourage roots by preparing them for what lies beyond. Where the surrounding soil nevertheless proves impenetrable, the plant can exist for a while in a sort of earth-bound container on what has been provided.

Products in bags labeled Planting Mix and Compost should be employed cautiously; most are entirely wood fiber—or almost so—and their lack of available nitrogen may rob plants of this essential element just when they need it most. Some of these bagged products are said to be "stabilized" with nitrogen. This usu-

ally means that ammonia has been incorporated in these to lessen the deficiency, but as a source of nitrogen, the ammonia is short-lived.

Peat is better than commercial planting mix for soil amendment in the planting hole. Thoroughly mixed with soil, it no longer resists wetting, and it has sufficient nitrogen to prevent significant losses from the soil during decomposition. Leafmold is better than peat, but the sweet, spongy black stuff is so rare that the very mention of it pains true gardeners.

More important than soil amendment is mulch—an insulating blanket on the soil over the root area to keep the ground moist and cool. Any material that will trap pockets of air near the soil surface can serve as a mulch, but decomposable material two or more inches thick works well, usually looks better in ornamental gardens, and also feeds the soil. Wood products are better than peat for mulching where summers are hot and dry. But during decomposition of wood fiber, bacteria can divert nitrogen from the plants—a risk lessened by adding fish meal or dried blood to the mulch. Rock, stones and pebbles keep soil cool and moist but will not, of course, decompose to improve the soil. Rocks and stones look best as a mulch in gardens of succulents, cacti and other plants associated with the desert, but are widely employed by enthusiasts for alpine plants, and others in emergencies to keep plants happy. Whatever else may be neglected, the provision of a generous mulch will redeem the gardener in the eyes of his new plants.

Throughout the first summer new plants will need heavy watering if, despite the mulch, rainfall is insufficient to keep the soil moist. Drip or trickle irrigation is a convenient way of providing this. Properly adjusted, this method directs water to the root zone with utmost economy. If water must be provided laboriously it will ease the chore if walls of soil are raised to form shallow irrigation trenches around plants at a distance from the stems that allows water to soak the growing roots and the soil just beyond them.

Pruning

Whole books are devoted to pruning;

some enumerate treatments for each tree and shrub by name and have supplementary chapters on the formation of scaffold branches, the increase of fruit yield, hedge trimming and lawn mowing—all aspects of pruning. In view of the trepidation with which many approach the subject, what few words can be offered here that will help gardeners who are convinced of the need to prune, but uncertain of the process? Perhaps words of comfort are best.

Shrubs in good health flourish, often despite the gardener's attention. Most will survive any pruning, but flowers will be lost if buds are removed. Pruning as though giving a haircut, essential on formal hedges and in topiary, is the kind most likely to remove flower buds. If done once in the year, however, and immediately after flowering, buds will usually develop for next season's flowers. In mild areas—those with a long growing season—removing the buds of spring from some shrubs in this way encourages flowering later in the year. By this means special garden effects may be contrived and flowers had for unusual arrangements.

The shorn look may charm the obsessively tidy, but most gardeners prefer plants with a more natural look. This is achieved by selective removal of old stems—an easier method of pruning and one that lessens the risk of a flowerless season no matter when done.

Preserving and Encouraging Flower Buds

Garden shrubs are generally of two kinds. There are those which have flowers on growth made the previous season, and those which flower on growth made the same season. Several shrubs in the first group benefit from removal of stems that have already flowered; this promotes new, more vigorous stems with finer flowers, especially if done in winter. *Deutzias*, *vanhoutte* spirea (*Spiraea x vanhouttei*), mock-orange (*Philadelphus*) and the many large-flowered forsythias (*Forsythia x intermedia*) are in this group.

Among shrubs flowering on growth of the same season, few, if any, call for frequent pruning unless badly placed. Lilac (*Syringa vulgaris*) and the flowering cur-

rants are of this kind. Except for the cutting that may be needed to build a shapely structure, removal of unwanted stems may be left to those gathering bouquets, so long as they are able to recognize stems that mar the plant.

Pruning ornamental plants is often a matter of improving their appearance. Decisions are best made standing back a little so that the shape of the plant may be studied and those branches singled out that are crowding or crossing others, are too long or are growing in the wrong direction.

A few shrubs are handsomer if pruned hard. Shrubby dogwoods and willows grown for the color of their stems may be cut to the ground each year to encourage a thicket of new bright growth. Old stems are less colorful. A less rigorous method is to prune back the vertical branches from one-half to two-thirds every third year, and annually to cut to the base all horizontal and wandering branches. This method results in a neatly upright shrub of medium height and bright color.

Slim growths can be removed with one-handed shears. Large ones require a pruning saw or a bow-saw. Two-handed shears, or loppers, cut more quickly through some branches that would otherwise call for a saw. Shears with curved blades are popular. Any with uneven sized blades should be used with the heavier blade *out* from the cut so that the

remaining wood will not be crushed. There are many brands, and some are irresistibly handsome tools. There are also blade-and-anvil shears, with a straight blade cutting against a metal pad. Sharp tools are important to good pruning, and the straight blade is so easy to keep razor-sharp on a simple oil-stone, that I prefer shears of this kind to those with curved blades. Curved blades need attention from specialist sharpeners. Gardeners sometimes forget to provide this attention and go on using shears when they are dull. This damages plants and makes pruning more tiring.

Many shrubs grow larger and more beautiful each year with no more intervention from the gardener than the removal of dead wood. In most cases drastic pruning checks or retards flowering. It is the misplaced plant, too large for its space, that so often needs attention. If cutting back is to be severe, the manner in which it is done will depend upon how and where new growth will be produced. Yews, for example, produce new shoots from cut limbs no matter how old; evergreen ceanothus, on the other hand, rarely, if ever, produce new growth from cuts in old wood. In the absence of information about the plant's behavior, cut a few stems, wait and watch. It may be a year before you have an answer, but it will be a reliable answer—from the plants in your own garden. ❧

FROST-HARDIER FORSYTHIAS

Forsythia, gay herald of spring, rivalling the daffodils. The official flower of the Borough of Brooklyn, no less! There are many kinds, all yellow, but by far the commonest is *F. x intermedia* 'Spectabilis'. Of the same bright yellow, and equally floriferous, are the Farrand hybrids ('Beatrix Farrand') with exceptionally large blossoms, 'Lynwood' and 'Karl Sax'. 'Spring Glory' has paler yellow flowers. These are all spectacular, and among the best where harsh winters do not destroy the unopened flower buds. The most bud-hardy among them, and the one to try if in doubt, is 'Karl Sax'.

The forsythias listed below are much less likely to be damaged by winter in the colder reaches of the North, such as inland New Hampshire and Upper New York State: *Forsythia ovata* 'Ottawa', *F. o.* 'Tetragold' (deeper yellow than the former), *F.* 'Robusta' (primrose yellow), and *F. mandchurica* 'Vermont Sun' (bright yellow, vigorous, not widely distributed yet).

Forsythias should not be sheared, nor pruned for the sake of pruning. They bloom best on mature branches. Prune by removing dead wood and, if necessary, cutting out a few of the oldest branches at ground level after bloom has passed in spring. ❧



Chinese witch-hazel (*Hamamelis mollis*)

WINTER-FLOWERING SHRUBS

Elizabeth Lawrence*

I should love, above all things, to have enough space (and energy) to make for myself a separate garden for winter flowers. Winter for me begins with the Feast of St. Martin, 11th November. About that time in Charlotte, North Carolina, we have our first killing frost. Shrubs that

bloom in winter have a beauty that is more than the beauty of those, no matter how resplendent, that bloom later in the year. Many of them are delightfully fragrant, as is evident from the frequency of *fragrans* as a specific name.

Arbutus unedo. The little fragrant white urns of the strawberry-tree may appear as early as the first week in October, and continue to bloom until January. The fruits are three-quarter-inch warty balls, green at first, then canary yellow, then rose-red, and all three colors are seen at one time. In Zone 8 this slow-growing

*Elizabeth Lawrence's interest in winter-flowering shrubs goes back many years. This article consists of extracts from her books, *Gardens in Winter*, 1977 Edition, Claitor's Publishing, Baton Rouge, and *A Southern Garden*, University of North Carolina Press, Chapel Hill, as well as a few excerpts from her letters.

shrub or small tree is hardy, but in severe winters some branches are cut back. Few shrubs of the Ericaceae or Heath Family will grow in alkaline soil, but in England strawberry-tree has been found to be lime tolerant.

Abeliophyllum distichum is ungainly, but the little fragrant flowers are lovely. It once bloomed on 10th February but usually not until late February or early March. Except in bloom it is unappealing.

Camellias. I should think that Tidewater Virginia would be about as far north as camellias could be expected to bloom in winter. I asked Frederic Heutte, Superintendent of Norfolk Parks, what sort of bloom he has in November, December, and January, and he said . . . "'Vedrine' and 'Lady Clare' are the most consistent of our winter bloomers . . . a severe cold snap does not seem to discourage subsequent blooming or injure their buds." *C. saluenensis* is one of the best winter flowering shrubs for the South for those who do not think that flowers must be large as dahlias. The deliciously scented pink-tinted flowers are fairly frost resistant, and it blooms from late October or early November until Christmas, and sometimes into spring.

Chaenomeles 'Pink Lady' is the most consistent winter-flowering quince for me. This winter it has been in bloom in mild weather from October into February—a week of days and nights below freezing has discolored the bright flowers, but there are more buds to come out in spring. This is a selection from a group of hybrids made by W. B. Clark in his San Jose, California, nursery, using three species of *Chaenomeles*. English gardeners grow a variety 'Aurora', which shows color from October onward, and bears "great goblets of coppery salmon."

Chimonanthus praecox (a good form). When the flowers are spread out flat, they measure an inch and a quarter across. The outer petals are of the palest amber, and so transparent that if you lay one over a line of print, you can easily read the words beneath. The short inner petals are heavily etched with fine, dark-red lines. Given room to spread, winter-sweet becomes a large round shrub ten feet or more tall and as wide or wider. Mine is

planted in a narrow corridor between the house and a tall screen of ivy. The lower branches have been cut off to allow room to pass, and it has grown so tall (fifteen feet) that from my bedroom window I can look into the upper branches and see the winter-afternoon sun shining through the flowers. The flowers are remarkably frost-proof, and go on blooming for two months. Even when they are caught by a freeze, the unharmed buds open as soon as the air is warm again. Wintersweet is hardy as far north as Philadelphia, but north of Washington it flowers after Christmas. It is at its best in the open, but blooms well with only afternoon sun.

Daphne odora I first saw at Orton Plantation, near Wilmington, North Carolina, where it grows under live oaks on a bluff. When it is in bloom, from December through March, its perfume carries 150 feet.

Daphne mezereum . . . refuses to grow for me . . . but as Mrs. Loudon says, "so general a favorite that it has pet names in almost every language. The French call it genteel wood; the Italians, the fair plant; the Germans, silky bark; and even the grave Spaniards term it the lady laurel." Only small plants transplant well. In Baltimore it blooms in March, with perhaps a few flowers in mild February; in Boston it blooms in April. Like *Daphne mezereum*, *D. genkwa* is deciduous. In California, however, it is apt to be partly evergreen; there it produces lilac flowers in January, although it is spring-flowering in cold gardens.

Erica. In our part of the world *Erica x darleyensis* is a most dependable winter-flowering shrub. It doesn't come into full bloom until February, but it begins to color early in December and there is never a winter day when I cannot pick lilac flowers for a nose-gay. *Erica carnea* (hardier, and more reliable in the Northeast) begins to bloom in January, or even a little before Christmas.

Some of the shrubs that flower in winter in the South are very hardy: *Hamamelis mollis*, *Lonicera fragrantissima* and *Viburnum farreri* (*fragrans*), but these are not winter-flowering in the cool regions that they come from, or in other severe climates.

Hamamelis mollis, the Chinese witch-hazel, blooms in March in interior Maryland, and usually before the end of January in North Carolina, but sometimes not until February or March. The flowers are several in a cluster, four threads of translucent gold caught in a wine-colored cup. Some forms drop their leaves before the buds open, others hold them until the new leaves come out, so the flowers are hidden. Next to *H. mollis*, *H. japonica* is the showiest of the Oriental species, and it is the only one with red leaves in the fall . . . though not as attractive, it is hardier, and can be used where the Chinese witch-hazel is not dependable. (Many of the witch-hazels now available are hybrids between these two species. Among the best are 'Jelena', with orange flowers, and 'Arnold Promise'. The original plant of 'Arnold Promise', at the Arnold Arboretum, measures twenty feet high and twenty-two feet wide. The flowers are yellow and autumn foliage is red and yellow. Two exceptionally good cultivars of the Chinese witch-hazel are 'Brevipetala' and 'Pallida', daffodil yellow and paler yellow respectively—Ed.)

Hamamelis virginiana. "It does seem to me," Chester Holway says, "that you might leaven your notes from gardens in the benign and gentle climates of the coastal states, with a note or two from a very different region, such as this one (near Madison, Wisconsin). Except under extraordinary conditions of weather, virtually the only woody plant to produce any winter bloom for us (and this only into early December) is the native witch-hazel, *H. virginiana*."

Jasminum nudiflorum. The winter jasmine bursts out in January if the season is propitious, and if it is planted in the sun. At its hardiness limit [Connecticut] it does not flower until winter's end, and not very freely unless trained against a warm and sheltered wall. It is usually pruned to keep it as an awkward shrub but is at its best when allowed to grow naturally as a vine.

Lonicera fragrantissima grows in every dooryard in the South . . . a large ungainly bush, unattractive even in full bloom, with nothing but its perfume to recommend it. Those who love it think

that is enough. (P. J. Van Melle, SHRUBS AND TREES FOR THE SMALL PLACE, writes: *L. fragrantissima* has been much confused with *L. standishii*, another Chinese of comparable floral qualities but of much neater and more erect habit, growing, in our zone, (Poughkeepsie, N.Y.) about six feet high. It is in every way preferable to *L. fragrantissima*—with narrower, tapering leaves and with the same kind of red berries. It is said to be less hardy, but it appears to be practically as hardy. One often receives it from nurseries under the name of *L. fragrantissima*.)

Mahonia bealei is an evergreen that I would always make room for, no matter how small the garden. Every feature is decorative: the bold pattern of the enormous pinnate leaves that crown the stiff stems, the intensely fragrant, pale yellow flowers, the bunches of apple-green berries that acquire a blue bloom as they mature. With me the flowers usually begin to open late in January. They are never frost-bitten, and are always followed by berries that disappear very suddenly after they ripen. I never know whether they fall off or are eaten by the birds. The shrub grows slowly to five or six feet, and sometimes gets leggy, but this can be remedied by cutting the old stems back to the ground and letting new, leafy ones come up. It wants shade, and will flourish even in deep shade, but it requires a good soil, rich in humus. It is hardy, with protection, at the Arnold Arboretum. (Where hardy, and available, *M. lomariifolia*, *M. japonica*, and such hybrids as 'Charity' are even more handsome—Ed.)

One of the most pervasive scents of winter is that of the sweet-olive (*Osmanthus fragrans*). In Thomasville, Georgia, there is one at every doorstep; in mid-winter the town smells like a perfume shop. The clusters of tiny white flowers are so nearly hidden by the glossy oval leaves that one wonders at first where the perfume comes from. In habit they are tall (to twelve to fifteen feet) and rather narrow for their height. They do best in the open.

Among the lesser shrubs that come through the winter with their leaves, sweet-box is the greenest . . . the variety

known in the trade as *Sarcococca hookeriana humilis* is an excellent ground cover where it is given some shade, and room to spread. It is hardy with protection at the Arnold Arboretum. I have never known it to be more than eighteen inches tall. Sweet-box is considered winter blooming . . . but I have never been aware of the flowers before February or March. I say aware, because they are so tiny I never notice them until I walk by some warm morning and wonder where the delightful fragrance comes from.

Viburnum farreri (fragrans) (also the similar *V. x bodnantense* hybrids) blooms in January in Oregon, in March in Maryland, but not until April at the Arnold Arboretum. *Viburnum tinus* (laurustinus) is considered hardy to Washington, but even in Charlotte it is killed back in severe winters. It blooms here mostly in February, but also flowers in mild spells earlier in winter.

Further delights of a garden in winter are the gray of lavender, the frosted green of santolina, and the dull olive of rosemary. These aromatic herbs from the

Mediterranean are very much at home in sunny, well-drained situations in southern gardens. This is a fact that we should remember when we abuse our climate, for rosemary, lavender and santolina are not very hardy in the northern states. A gnarled rosemary is one of my chief treasures. I treasure it for the charm of its irregular outline, for the pale blue of its flowers in very early spring, and for the refreshing odor of its foliage as I brush against it in passing. These three herbs need a poor light soil. *Santolina* will stand any amount of drought but no excess moisture. All must bask in full sun.

March, 1980. We had six inches of snow over the weekend. On Friday I picked *Erica carnea*, one fairly good camellia ('Magnoliiflora') and *Sarcococca*. Buds of *Viburnum x bodnantense* 'Dawn' were not hurt by the earlier freeze and had come out with the first warm days.

*Still may you with your frozen fingers cut
Treasures of Winter, if you planted well. . .*

V. Sackville-West
The Garden ❧

A promising and novel alternative . . .

GROUND-COVER AZALEAS

The North Tisbury hybrids are the result of a collaboration between the breeder, Dr. Tsuneshige Rokujo, of Tokyo and the author (North Tisbury, Massachusetts), using Dr. Rokujo's seeds. Hardy to at least -9°F on Martha's Vineyard, these evergreen ground-cover azaleas are late-blooming; they flower through June and into July. Here are a few cultivars that have been named from this group: 'Joseph Hill', brilliant red, twiggy; 'Michael Hill', salmon pink, vigorous low creeper—it roots as it spreads; 'Late Love', a rosier-pink sibling of 'Michael Hill', sometimes lingering into August; 'Alexander', very hardy, light red, will hang down over a bank; 'Pink Pancake', a trifle slower to take hold, with narrower leaves and flatter habit.

'Jeff Hill' is a low plant resembling boxwood but with handsome blotched flowers in two shades of red. 'Louisa' is an earlier-blooming, low, pale pink, flowering over a period of several weeks. Others are: 'Yuka', pure white satsuki-type; 'Libby' and 'Corinna Borden', both grown from seed of the white form of *Rhododendron kaempferi*; the former is a medium fresh pink, and the latter is a pale cloud of dusty pink. They are compact, but not creepers as are the others listed.

From the wild in Taiwan comes a selection of *Rhododendron nakaharai* named 'Mount Seven Star'. Hairy, twiggy, low and hardy, this has 2½-inch-wide flowers that are pure cadmium red. It makes an ideal rock garden plant.

Polly Hill

ROSES AS FLOWERING SHRUBS

Beverly R. Dobson

When most gardeners think of roses they visualize formal beds of hybrid teas or informal groupings of floribundas, separated from the rest of the garden so that their somewhat exacting cultural needs of pruning, fertilizing and spraying can most easily be met. Few gardeners know the great range of carefree shrub roses available for almost any imaginable landscape or planting effect. These can be bought from specialist mail-order nurseries, but demand sometimes exceeds supply, so order early.

Many gardeners do know about 'The Fairy', a pink-flowered shrubby polyantha rose useful for banks and hedges. There are many other polyantha roses in a variety of colors. Some are tinier, like coral-orange 'Margo Koster', making neat edgings and small enough, even, for the rock garden. All are healthy and do not need spraying for fungus diseases if grown in an open position. Polyanthas are the latest roses to come into bloom, but will then bloom for the rest of the growing season.

The very early-blooming shrub roses are larger plants for broader landscape effects. A favorite is *R. hugonis*, the golden rose of China, with bright yellow single flowers and arching sprays of dense fernlike foliage. Taller, more upright 'Harrison's Yellow' has bright unfading semi-double flowers for four to six weeks. A real treasure is 'Golden Wings', with medium yellow fading to cream flowers with bright golden stamens. In lower New York State it blooms continuously throughout the growing season. 'Frühlingsgold' has upright arching sprays, five to seven feet, and large, creamy-yellow single blooms for four to five weeks. 'Nevada', five to seven feet high and wide, has large, single white blooms throughout the season and red

canes in the winter landscape. There is a pink sport, 'Marguerite Hilling'.

Many delightful shrub roses bloom only once, but then develop decorative fruits, called hips. Others bloom continuously, and some even continue to flower after hips form. There is such a wide variety that the only problem is finding the most suitable shrub rose for a particular situation. Like all roses, they do best in a sunny location. They need not be sprayed but should be lightly fertilized (except *R. hugonis*, which prefers poor soil) and, as with any woody shrub, occasional dead wood should be removed. Beyond that, judicious pruning may certainly be practiced (done after flowering), but this is not needed if they are placed where they can develop to their full potential and achieve their greatest beauty. Any rose is subject to aphids, which can be washed off with a strong spray of water from the garden hose, and any rose, while needing good drainage, rewards regular deep watering.

R. hugonis, mentioned above, is widely grown for its beautiful foliage alone, as flowering is brief, usually two or three weeks. Other species roses with a longer flowering period and even more spectacular bloom would be grown and loved, even if they never bloomed at all, for their other good qualities. *R. omeiensis pteracantha*, with tiny white inconspicu-

A hybrid rugosa, *Rosa* 'Pink Grootendorst', has sawtooth petals and semi-glossy foliage.



ous flowers, is grown for its ferny foliage and large, translucent red thorns, which give an effect like stained glass. *R. eglan-teria*, with small pink flowers followed by shining red hips, is grown for its fragrant foliage, smelling like apples on humid days or when watered with the sprinkler. *R. rubrifolia* has arching, upright canes, five to seven feet high, clad in foliage varying in color according to exposure to sunlight, from a coppery red to a purplish, plum red. The pink flowers are tiny, but attractive for three to five weeks in early summer, followed by glittering red hips. This species has few thorns.

R. roxburghii is called the chestnut rose. The double form, discovered first and given the species name, is somewhat less hardy than the single *R. roxburghii normalis*, which is reliable in the lower part of New York State. An upright, angular plant, six to seven feet high, it has ferny foliage, large, delicate light pink single flowers, and large bristly hips. *R. virginiana* has upright, arching sprays, five to seven feet, and single pink flowers, shining hips retained into winter, and disease resistant foliage that turns a beautiful color in autumn. Good for a large hedge. *R. nitida*, similar but smaller, suckers strongly, but makes an excellent low hedge. As an attractive, disease-free ground cover, or to flow over a bank or retaining wall, try 'Sea Foam', with pale pink flowers fading quickly to white.

R. rugosa in mauve-pink, *R. rugosa rubra*, very deep pink, and *R. rugosa alba*, white, all make excellent medium-sized hedges or good, dense, free-standing shrubs, with deep green minty-looking foliage. They can be sheared if desired. They are continuous flowering, fragrant, the alba form especially clove-like, and all form hips resembling cherry tomatoes. 'Delicata' (four to five feet) and 'Belle Poitevine' (seven to eight feet high and wide) are similar rugosa hybrids with fragrant, semi-double mauve-pink blooms, good hips, and foliage fully as handsome as the species.

Hybrid musk roses bloom continuously in sun. In part shade expect one good flush with some repeat bloom. Some fragrance, but not pervasive, and foliage is less disease resistant than most other

shrub roses. 'Penelope' (light pink fading to white), 'Buff Beauty' (amber gold), 'Will Scarlet' (bright medium red), 'Van-ity' (deep pink), 'Pax' (white), 'Cornelia' (pink blend) and 'Belinda' (medium pink) are all good choices for large, loose hedges and groupings.

The gallic rose variety *R. gallica* 'Officinalis' is an upright, sturdy shrub about three feet tall, having almost-single flowers of bright, deep pink with spectacular golden stamens. 'Rosa Mundi' (Versicolor) is its sport, striped pink and white or pale blush. Among the most fragrant of all shrubs, gallic roses are stunning as individual plants, or as a low-to-medium hedge. 'Celestial' is another intensely fragrant rose, symmetrical, spreading five to six feet high and wide, with bluish-green foliage and light pink semi-double flowers for four to six weeks, followed by attractive hips.

It is important to choose shrub roses hardy in your climate, truly disease resistant and with flowers that shatter cleanly. Know the likely dimensions, and you will certainly have a preference for certain flower colors or form. Roses range from singles with five petals to very double blooms with over three hundred petals, and from a loose, open face with bright stamens to full reflexing balls of tightly packed petals with a central pip or button eye. Choose the right roses and your enjoyment of them will increase year after year. A little research in the beginning will pay off, and I recommend the following books: *The Old Shrub Roses*, *Shrub Roses of Today*, *Climbing Roses Old and New*, all by Graham Stuart Thomas, Phoenix House, London; *Shrub Roses For Every Garden*, Michael Gibson, William Collins Sons & Co. Ltd., London; *Wild and Old Garden Roses*, Gordon Edwards, Hafner Press, New York; *The World's Favorite Roses*, Jack Harkness, McGraw-Hill, New York; Also the reprints of classic old rose books published by Earl M. Coleman, P.O. Box 143, Pine Plains, New York 12567 (leaflet available). [Note: Mrs. Dobson (215 Harriman Road, Irvington, NY 10533) publishes each year a source guide for hard-to-find roses. Send self-addressed stamped envelope for details—Ed.] ❀

*Fothergilla monticola*

DON'T NEGLECT THE EASTERN NATIVE SHRUBS

Pamela Harper and Robert M. McCartney

Flowering shrubs are abundantly distributed throughout the world, being found in all but the most inhospitable environments. Native, of course, refers to being endemic, or occurring naturally within a specific geographical area—in this case, these eastern United States. Such a large and varied area understandably supports a great diversity of flowering shrubs. Indeed, a formidable array may be native within just one state.

Many native shrubs (exotic ones, too) can be cultivated in environments which differ markedly from their original habitats. Others are more particular. A shrub locally native is adapted to the climate of that area, but there are still considerations of soil, sun, shade, moisture or dryness to be taken into account.

Shrubs native to other parts of the country may or may not succeed. Gardeners in New York can grow more shrubs from Japan than from California. One species in a genus may fail in a particular area or site, another succeed. Mountain-laurel (*Kalmia latifolia*) usually grows on well-drained, often rocky slopes, but *Kalmia polifolia* grows in bogs. Southerners might fail with both, but have just the conditions liked by the little, silvery-leaved sandhill-laurel (*Kalmia hirsuta*), with nickel-sized dusty-pink flowers in summer. It is native to damp woods and savannas.

An earlier generation, less spoiled for choice than we, introduced into their gardens such shrubs as the clove-scented buffalo currant (*Ribes odoratum*) and

Carolina-allspice (*Calycanthus floridus*). Grandmother may have been given a layer or "slip" by a neighbor, or grandfather may have dug the plants from the wild, a practice neither inherently good nor bad. There is today much indiscriminate collecting of wild plants, which often do not survive. Conversely, many plants in the path of "progress" have been rescued and successfully relocated by gardeners knowing the requirements of the plant, the importance of timing and the proper transplanting technique.

A nursery-grown plant of good quality has usually the best chance to succeed. Native plants obtainable from nurseries include bottlebrush buckeye (*Aesculus parviflora*), chokeberry (*Aronia*), Carolina-allspice (*Calycanthus floridus*), summersweet (*Clethra alnifolia*), Fothergilla, mountain-laurel, oakleaf hydrangea (*H. quercifolia*), *Leucothoe fontanesiana* and Oregon-grape (*Mahonia aquifolium*). There are selected forms and hybrids of many of these—a pink summersweet, red-budded or white-flowered mountain-laurel, and double-flowered oakleaf hydrangeas. There is also the well-known hills-of-snow hydrangea (*H. arborescens* 'Grandiflora'), derived from another native species. *Leucothoe* 'Rainbow' is popular with flower arrangers, the coloring of new leaves passing through shades of cream, yellow, pink, red and green. *Leucothoe* 'Scarletta' is low growing, with brightly colored new leaves.

Adaptability?

Low-maintenance gardening is a current theme. Less work is required when a shrub is well matched to its site, and in this we can take a leaf from nature's book. Either it adapts, or it dies. There is no coddling. No amount of wishful thinking will enable the sumptuous tree peonies or elegant camellias to grow on a beach, or in a swamp, but there are shrubs that will. On the sandy shore

grows the beach plum (*Prunus maritima*), arrowwood (*Viburnum dentatum*), *Rosa virginiana* (cheek by jowl with the foreign but naturalized *Rosa rugosa*), bayberry (*Myrica pensylvanica*) in the North, and in the South and West the similar but less hardy wax-myrtles (*M. cerifera* and *M. californica*). The saltbush (*Baccharis halimifolia*) hovers cloudlike over the marshes in October, the diaphanous whiteness not flower but the groundsel heads of gossamer-winged seeds.

Wildflowers are often equated with weeds, and if a weed is a plant that does not stay where put, then "weedy" some of them are. Observe the pink spires of hardhack (*Spiraea tomentosa*), growing by the acre in moist fields, and you will deduce that this is not for the small, neat garden. But if an area of lawn and flowers near the house merges into wasteland, there may be a place for such a pretty, vigorous and carefree plant. With native shrubs, as with any other, matching the plant to the site is the secret of success.

Sometimes a foreign species is more adaptable than a native one, and sometimes it is prettier. On both counts the Japanese *Pieris japonica* scores higher than the American *P. floribunda* which is, however, cold hardier. But where a foreigner cannot adapt there may be a native to take its place. All things being equal, two "foreign" hypericums are the most admired—'Hidcote' for its great yellow



Summersweet (*Clethra alnifolia*) may be grown as a specimen, massed or mixed with other shrubs. The usually white flowers are exceptionally fragrant.

George Tatum



Sweetshrub, strawberry-shrub and Carolina allspice are all names for *Calycanthus floridus* whose deep reddish-brown May flowers have a distinct scent.

bowls of flower, 'Elstead' for the heads of brilliant red and yellow cone-shaped fruits. Both may fail, or be disappointing where summers are excessively hot or winters excessively cold, conditions that less often faze the native *H. frondosum*, *H. kalmianum* and *H. prolificum*. These are quite similar three- to four-foot-tall shrubs with pretty blue-green leaves (evergreen in the South) and yellow flowers. *H. frondosum* (Zone 5) has the largest flowers of the three, two inches across with a boss of yellow stamens, but it is a mite less hardy than the other two. *H. f.* 'Sunburst' is superior to the species, growing wider than high.

Overlooked Shrubs

If many native shrubs are well-known and appreciated, others are strangely neglected. Summersweet (*Clethra alnifolia*) is a familiar sight in gardens, but how rare the caressable cinnamon stems and yellow and orange fall foliage of *C. acuminata*. This southern Appalachian species is hardy to New England.

The flowers of American beautyberry (*Callicarpa americana*) (Zone 7) aren't much to write home about, but the berries, in rondels round the stems, are as brilliant as the gentian violet that used to be prescribed by dermatologists. For it-

self it chooses woodland fringes, but it is happy enough in sun if the soil is moist. There is a white-berried form, and the two enhance each other. A single plant overhanging and growing through a white picket fence makes a pretty sight, and the vibrancy of a group of five, backed by dark evergreens, halts even non-gardeners in their tracks. Northerners must make do with the hardier oriental species, *C. bodinieri*, *C. dichotoma* and *C. japonica*, which can be grown as far north as coastal New England. These are good second-bests in our view, but on all counts save hardiness the native species excels.

None too many shrubs will grow where water laps their feet. One that thrives in wet ditches (but does not insist on them) is the buttonbush (*Cephalanthus occidentalis*), otherwise known as honey-balls. It is a magnet for every insect in the neighborhood when the cream-white spheres of several hundred minute, tightly packed florets give an odor to the air in midsummer resembling privet. These sunlike orbs are stuck all over with yellow stamens. Buttonbush makes a vigorous shrub, growing as tall as twelve feet in the South (much less in the North). It is fully hardy in New England and will grow in full sun, but part shade is better the further south one goes. Buttonbush should not be used

as a focal point because the foliage is rather coarse.

Another moisture lover is *Zenobia pulverulenta* or honey-cups. B.G. Wells (*The Natural Gardens of North Carolina*) describes it as "the blue-ribbon winner of our bog society." In its best form, which is the least common in the wild but available from some nurseries, the leathery leaves have a grapelike bloom. In spring this loosely-branched, low spreading shrub bears pendulous clusters of white, bell-shaped flowers which resemble lily-of-the-valley. *Zenobia*, a southern native, is hardy as far north as central New England, where it is deciduous. In the South it is partly evergreen. Wells says that this ericaceous plant needs part shade, but it will not compete with tree roots and may do better in full sun if the soil is moist.

Euonymus americana, a shrub called strawberry-bush, hearts-a-bustin' or a dozen-or-so other names depending on locality, does not vie with the flowers of spring and summer. However, in autumn it would be hard to ignore the bean-shaped, sealing-wax-red berries dripping from strawberry-pink parasols, which are in turn suspended from smooth stems that retain their greenness the year around.

Conradina

Last, and least in size but not in importance, *Conradina verticillata*. This has a rare virtue—rabbits don't like the strongly aromatic, rosemarylike foliage, hence one vernacular name, rabbit-bane. Another is Cumberland-rosemary. For a month in spring the dark green foliage is obliterated by the massed lavender blue-lipped flowers.

This *Conradina* is a rare southeastern native but, given sun and sandy, well-drained soil, it is amenable to cultivation, and hardy as far north as coastal New England. This low, spreading shrublet is evergreen in the South, but in the Philadelphia area it is reported to look somewhat bare in winter, the leaves a discolored brown-gray. Established plants layer themselves, and rooted branchlets can be detached to start a new patch. If old plants get woody and bare they can be rejuvenated by replanting them with only the tips of the branches emerging from the soil, a method much used for heathers before propagation techniques became more sophisticated. *Conradina* is beginning to receive acclaim in England. Must it emigrate to be appreciated? ❧

AN ADAPTABLE DAPHNE

Daphne—source of delight and despair. Just as Daphne, the legendary maiden, fled from Apollo's ardor, so most of her namesake shrubs resist the gardener's blandishments. Even when one seems wooed and won the odds are high that it will one day, suddenly and without warning, quietly steal away. "Grow old along with me" is too much to ask of any daphne, but their fickleness varies in degree. Ten-year marriages are not unusual with *Daphne x burkwoodii* (*caucasica x cneorum*), at which age it may measure three feet high and twice as wide. Of the three clones in cultivation two, 'Albert Burkwood' (usually sold just as *Daphne x burkwoodii*) and 'Somerset' are similar sister seedlings of English origin, with whorls of slender leaves and spring-borne clusters of intensely fragrant lila-like flowers.

'Carol Mackie' originated in the garden of Mrs. Carol Mackie, Far Hills, New Jersey, in 1962 and was first marketed by Watnong Nursery, Morris Plains, New Jersey, in 1968. 'Carol Mackie' differs in that new leaves are narrowly edged in yellow, this rim appearing white or creamy on mature plants. It is a shrub admired, says one grower, "even by those who don't like variegated plants" (who, by the by, also usually make exceptions for *Pieris japonica* 'Variegata', *Kerria japonica* 'Picta' and *Daphne odora* 'Aureomarginata'). The Vermont Agricultural Experiment Station reports 'Carol Mackie' to be hardy at -25°F. In nine years of observation no insect or disease problem has been apparent. They have found it to grow best on well-drained soil at pH 4.5 to 6.5. ❧

Doublefile viburnum (*V. plicatum tomentosum*)

For flowers and fruits . . .

VIBURNUMS OLD AND NEW

Michael A. Dirr

Anything I offer concerning viburnums should be considered slightly biased, for I have had a long-standing love affair with this most versatile and aesthetic group of flowering shrubs. Viburnums cannot be stereotyped. They come in different shapes and sizes, flower forms and scents, leaf shapes and colors, degrees of hardiness and adaptability. Unless otherwise stated, the flowers are white. Several hundred species, varieties and cultivars exist. For ease of presentation, I have chosen to divide the viburnums into six distinguishable groups:

Flowers in Panicles, Early, Before Leaves, Fragrant

This group is not well known but lengthens the viburnum flowering season. The plants bloom well before the leaves, usually in March or April. Often they will open in fall or during the first warm

period of late winter. The most common species is light-pink-flowered *V. farreri* (*fragrans*). It attains about eight feet in height in as many years and is of sprawling, often ragged, habit at maturity. Cultivar 'Alba' ('Candidissimum') has white flowers, and 'Nanum' is a three- to five-foot mounded form with small light pink flowers. *Viburnum* x *bodnantense* resulted from a cross between *V. farreri* and *V. grandiflorum*. Pink-flowered 'Dawn' is its only cultivar that is usually available in the United States. These viburnums and others such as *V. carlesii* are still occasionally grafted onto *V. tan-tana* understock, and suckering can be a persistent problem.

Flowers Semi-Snowball, Fragrant, With or Slightly After the Leaves

This group is perhaps the most popular. Deep red-to-maroon buds precede the

pink, finally white flowers. The blossoms emit a daphnelike scent that is the rival of any fragrant-flowered plant. In northern gardens they may start to bloom in mid-to late April and continue into May; in the mid-South they begin a month earlier. The fruit is a red drupe (stonefruit) which ripens to black and is not usually showy.

Korean-spice (*Viburnum carlesii*) is the most popular type but is vulnerable to a leaf spot disease. It forms a six- to eight-foot-high mound at maturity though pruning can keep it one-half this size. *V. carlesii* is among the most fragrant of this group. There are a number of selections, but the one I find most appealing is 'Compactum'. *Viburnum x juddii* was selected at the Arnold Arboretum and in most respects is superior to *V. carlesii*.

Viburnum x carlcephalum is the result of a cross between *V. carlesii* and *V. macrocephalum keteleeri*. It is a larger, coarser plant, slightly less fragrant in flower, and blooms a week later than its parents. The flowers are often borne in clusters up to five inches in diameter. 'Cayuga', a National Arboretum introduction, is more compact and disease resistant. Two other excellent choices are *V. x*

burkwoodii 'Burkwood', and *V. x burkwoodii* 'Chenault'. Both resulted from crosses between *V. carlesii* and *V. utile*, and are semi-evergreen to evergreen. 'Chenault' has more refined stems and slightly smaller flower clusters and leaves. 'Chenault' grows to ten or twelve feet but with pruning can be maintained at one-half that size. 'Mohawk', a backcross of *V. x burkwoodii* with *V. carlesii*, is notable for dark red flower buds which open to white. Semi-snowball types are winter hardy to Zones 4 and 5, except *V. x carlcephalum*, (Zone 6).

Snowball, Non-fragrant, Sterile, With or After the Leaves

Japanese snowball (*Viburnum plicatum*), guelder-rose (*V. opulus* 'Roseum' ('Sterile')) and Chinese snowball (*V. macrocephalum*) are the principal representatives. The common characteristics include a rounded flower cluster that is green in the early stages and gradually changes to white. The two- to three-inch-wide clusters of flowers of the Japanese snowball, which open in late May in the North, sit opposite each other along the horizontal branches. This is a

The red translucent fruits of the European cranberry viburnum (*V. opulus*) follow the showy white flower clusters. The maplelike leaves have good autumn color.



large shrub, growing to ten or twelve feet. In early May the flowers of Chinese snowball engulf the shrub in massive froths of white. This is the most common type in the South, where it often flowers again sporadically in fall. The plant forms a rounded outline and usually matures between ten and fifteen feet.

The guelder-rose is often found around old residences. The clusters of flowers, which are up to three inches across, are quite showy in mid- to late May. Aphids often disfigure the young shoots. This is the hardiest of the snowball types (Zone 3). Japanese snowball can be grown in Zone 5 but performs more satisfactorily in Zone 6. Chinese snowball is best suited from Lower Zone 6 to Zone 8.

Lace Caps

The name "lace cap" refers to the structure of the flower clusters. The outer flowers are sterile and showy; the inner ones are fertile and inconspicuous. Neither is fragrant. The fertile flowers, when pollinated, give rise to abundant fruits. Doublefile viburnum (*V. plicatum tomentosum*), European cranberry-bush (*V. opulus*) and Sargent viburnum, (*V. sargentii*) are among the best.

All cranberry-bushes are large, ten- to fifteen-foot-high, rather coarse shrubs. The flower clusters, which are three to four inches wide, appear in mid-May, followed in September by clusters of red fruit that persist into winter. Three compact forms, two from the American species, the other from the European, have been selected. They grow half the size of the species, yet flower and fruit prolifically. Of the two American forms, one develops a good red color in fall, the other a muted yellow. The American selections are more refined and make better landscape plants than the European form. Do not confuse these with *Viburnum opulus* 'Nanum', a smaller, rounded shrub which rarely flowers.

The flowers of *V. sargentii* can be used to distinguish it from *V. opulus* and *V. trilobum*. The fertile flowers have reddish stamens compared to the cream or yellow stamens of *V. opulus* and *V. trilobum*. *V. sargentii* 'Flavum' has golden yellow fruit, and 'Seneca' has excellent orange-

red fruit that matures to blood red, stays firm and is not devoured by birds.

Doublefile viburnum is the most spectacular lacecap, with its horizontal branching and flowers raised in two opposite ranks along the stems. A mature specimen eight or ten feet tall has few rivals among flowering shrubs. It will grow and bloom in sun or shade. The three- to four-inch-wide clusters in early to mid-May are followed by bright cherry red fruits, quickly consumed by birds. The reddish-purple fall leaf color offers additional seasonal interest. Most viburnums are easy to root from softwood cuttings, and this might be the easiest. 'Lanarth' is larger flowered than typical doublefile and branching more horizontal. 'Mariesii' has long been considered a choice selection because of the abundant, large flowers and accentuated horizontal branching. 'Pink Beauty' often develops pink sterile florets. 'Shasta' is a National Arboretum introduction of great promise. Temperatures below -10 to -15°F often result in winterkill with this group.

Cymose or Paniced, Deciduous, Usually Non-fragrant

This is an extremely large group, characterized by flat-topped inflorescences. The flowers are white, fertile, and usually appear from mid-May to early June, after the leaves. Their odor, fortunately only apparent at close range, varies from mildly unpleasant to almost unbearable. The fruits may be blue, red, rose or combinations of these colors at different stages of maturity as in the native witherods (*V. cassinoides*, *V. nudum*). Arrowwood (*Viburnum dentatum*) a tall, rangy shrub, is native to most of the eastern and midwestern states, from the sandy salt-laden beaches of Cape Cod to the heavy clays of Illinois. The white flowers are effective from late May to July and are followed by bluish fruits that are relished by birds.

Linden viburnum (*V. dilatatum*) forms a broad mound that is smothered with white flowers in late May and early June, followed by persistent cherry red fruits. 'Iroquois' is an excellent National Arboretum introduction with abundant creamy white inflorescences, large,

glossy, dark red fruits, and thick-textured, dark green leaves.

Tea viburnum (*V. setigerum*) has small flowers (1½ to 2½ inches across) and a rather open, leggy habit but merits consideration because of the large, red, persistent fruit, as does the orange-fruited 'Aurantiacum'. Both can be striking. Rusty or southern blackhaw (*V. rufidulum*) and blackhaw (*V. prunifolium*) develop into large shrubs or small trees (fifteen to twenty feet). The former has lustrous, leathery foliage and interesting rust-colored buds. Flowers (mid- to late May) on the two species, are often abundant. The fruit passes from yellow to pink to rose to blue, all colors often present in the same cluster. Their bark is rather handsome as it develops a block-scaly character similar to that of flowering dogwood.

Wayfaring tree (*Viburnum lantana*) and Siebold viburnum (*V. sieboldii*) cannot be omitted. The most notable feature of wayfaring tree, which is a coarse grower, is the glossy yellow-red-black fruit. Siebold forms a massive shrub or small tree that may reach twenty or twenty-five feet. The red, then black, fruits provide dazzling late summer color, and after they fall or are eaten by birds, the rose-red fruit stalks remain another two to four weeks.

Evergreen, Cymose or Panicked, Usually Flat-topped and Non-fragrant

The white flowers open in May and are followed by red fruits that turn black at maturity. Fruits on a few species turn blue, but are not usually abundant on single specimens. A planting should contain different clones or seedlings to insure cross-pollination and good fruit set—in fact, a wise policy for all viburnums grown for their fruits. This group is the least cold hardy of the cultivated viburnums, and species like *V. davidii*, *V. suspensum*, *V. utile* and *V. tinus* perform best in the South or milder parts of the West. *Viburnum rhytidophyllum*, leatherleaf, is the granddaddy of the evergreen types. It grows to fifteen feet, and the



Gutsche-Schleier

eight-inch-long, leathery, lustrous dark green leaves are the most prominent feature. The naked flower buds are often injured in cold climates and temperatures in the range of -10°F will kill both flowers and young stems. *V. x rhytidophylloides* (*lantana x rhytidophyllum*) is deciduous. Its selections include 'Willowwood', which often reflowers in autumn, and 'Allegheny', which is more compact.

The service viburnum (*V. utile*) is a glossy, small-leaved species of unkempt habit. The foliage, however, is spectacular and has been incorporated into several hybrids. *V. x pragensis* (*V. utile x rhytidophyllum*) seems to have the best qualities of both parents. Faint pink buds give rise to white flowers. It grows eight to ten feet high and has the most lustrous, dark green leaves of any hardy viburnum, and these remain completely evergreen after exposure to -6°F. Heat tolerance also appears high. David viburnum (*V. davidii*) is a small mounded form with leathery dark green leaves. The white flowers give rise to light blue fruits, but a solitary plant rarely fruits much, if at all. David is not hardy north of Zone 7. Laurustinus (*V. tinus*), functions as an excellent large (ten- to twelve-foot) screen. The two- to three-inch long, lustrous dark green leaves are densely arranged and result in a solid evergreen mass. The white flowers (late March-early April in Georgia) and blue-black fruits are not showy. One of the best evergreen viburnums for the South. ❧



Camellia x williamsii 'Donation'

*For milder climates, departing
from the stereotyped kinds . . .*

UNCOMMON CAMELLIAS OF SUBTLE BEAUTY

Josephine Zeitlin

You can tell us by our gardens. They're unconventional, with the old-fashioned and shrub roses instead of the hybrid teas; in our iris beds are varieties of *I. unguicularis* and drifts of Siberians; the clematis we choose are likely to be the

small-flowered species such as *C. texensis* and *C. tangutica* as opposed to the often extravagant-appearing, large-flowered hybrids. We'll trade our 'Empress of India' lilies for dainty martagons and we opt for *Rosa* 'Mermaid' over 'Peace' every time.

Knowing what appeals to us, we are constantly seeking to indulge our preference. Since it's apparent we belong to the minority in our passion for one less row of petals and a smaller, less ruffled fall, we must dig a little deeper to fill our gardens; scour the specialist catalogs, begin to grow from seed the plants we want, and seek out those gardeners of similar disposition to share discoveries.

In exploring for garden candidates in the camellia world, I found that my interest began to reach a plateau after acquiring a few of the more commonly available *sasanqua* and *hiemalis* cultivars. My excitement rekindled when I later stumbled upon, then sought out, the following species and hybrids. All possess that chaste, uncluttered beauty that can always find a spot in my garden.

Species and Hybrids with Small Flowers

Camellia cuspidata is an upright, willowy native of South China eventually growing to six feet. (Most camellias in this article will attain this size.) Its small, creamy white flowers face upward and outward, while the leaves, coppery in their new growth, curve downward like pairs of wings. Petals are recurved, creating a bold, assertive demeanor which is almost at odds with its delicate appearance.

C. fraterna wears its small white blooms on branches arching in flat sprays. From afar the plant in flower recalls the charm of a willow gentian. It shows best in a light woodland setting and is ethereally fragrant.

C. lutchuensis, native to Okinawa and the islands south of Japan, is my favorite of this group. It's a lithe, fountainous crinoline of leaves only 1-1½ inches long, ravishing in new growth (bronzy-pink-apricot, almost iridescent). This camellia bears a profusion of tiny white bellshaped flowers which bob with the branches in the slightest breeze. Blooms have that delicacy and appeal shared by snowdrops

(*Galanthus*), and exude a sweet bouquet soft as talcum powder. The plant looks well cascading over a rock wall, especially if situated so one can visually enter its nodding blooms. It is a natural choice for a dappled woodland but shouldn't be too shaded, since its greatest moment is when the fresh young foliage quivers in the sun's rays.

The habitat of *Camellia rosaeiflora* is unknown; it is most likely from China and could be a *C. sinensis* hybrid. Leaves and flowers are similar to *C. lutchuensis* except that the plant is more erect and the flowers are an exquisite, clear, soft rose-pink (the color of strawberry ice cream). *Camellia tsai* is native to western China, Burma and Indo-China. This has a stiff, flat branching pattern upon which it displays its small white flowers and wavy-edged leaves two inches long. New foliage is a strikingly beautiful red-plum-brown. Because the leaves appear a bit too large for the flowers, this camellia might be considered a bit awkward in form to some gardeners. Others may find it too frost tender.

Camellia 'Cornish Snow' (a *C. cuspidata* and *C. saluenensis* hybrid) is an exhilarating sight over a long season. Plant it to festoon, its small white, loosely ruffled flowers lighting in its branches like hordes of butterflies. Deep purple stains its unripened foliage during summer, an added joy for the flower arranger.

Camellia 'Fragrant Pink' (*C. rusticana* x *lutchuensis*) creates a large mound of cascading foliage, an arresting sight when sunlight on its bronze-red young growth seems to set it afire. This plant is effective near water or as a focal point in a woodsy setting. The tiny blooms, of miniature-peony form, are salmon pink asterisks with a fragrance more realized in the surrounding still air than a quarter inch from the nose.

The Williamsii Hybrids

A much-improved garden plant emerged from a series of crosses made in England by John Charles Williams of Caerhays Castle, Cornwall, prior to 1930. He selected plants brought to England from China by George Forrest, whose plant-hunting expeditions he supported. *C.*



Camellia japonica 'Magnoliiflora', has flowers which seem to float above the dark green foliage.

saluenensis was Williams' chosen female parent, and pollen was gathered from plants of *C. japonica*. The resulting Williamsii Hybrids were a testimony to hybrid vigor, exhibiting an earlier, more profuse flowering over a more protracted season than most of the older japonica varieties. The plants also flowered more normally after severe winters, due to earlier bud formation. Moreover, they cleanly and promptly shed spent and damaged flowers—an endearing trait which inspires constant admiration as well as gratitude. These earliest crosses were considered so successful that, in commemoration, later crosses between the same species, made by other plant enthusiasts, were called Williamsii Hybrids as well.

Aside from their responsible garden habits, the Williamsii Hybrids are among the loveliest of flowers. In their clarity of form and subtlety of hue, they project a guilelessness one never tires of. Few are easily obtainable in the United States, but with a little luck and tenacity these gems may cross your path: 'J.C. Williams' was the first named selection, introduced in 1940. It is the epitome of that subtle beauty that characterizes the single-flowered kinds. Flowers are a wistful pale pink, inhabiting almost horizontal branches. Other notable Williamsii Hybrids include 'St. Ewe' (with rose-pink, slightly cup-shaped blooms; an erect shrub with glossy leaves covering red shoots); 'November Pink' (the earliest of

this group to flower); 'Caerhays' (lilac-rose, semi-double; growth is spreading and pendulous).

'Donation' is perhaps the most celebrated Williamsii Hybrid. Many consider it the greatest camellia raised in this century. Blooms are silvery orchid-pink with deeper pink veins, loosely semi-double. Its habit is erect and compact, with dark green foliage. 'Glenn's Orbit', its seedling, blooms a month or two earlier.

More recent selections of *C. saluenensis* x *japonica* include: 'Julia Hamiter' (another seedling of 'Donation'; delicate blush pink semi-double to rose-form double); 'Angel Wings' (semi-double with narrow, upright petals, washed with white and shaded orchid pink); 'E.G. Waterhouse' (light pink formal double with purity and elegance); and 'Garden Glory' (rich orchid-pink-rose-form double; it is extremely vigorous and makes a stunning, rapid-growing espalier). This last-mentioned cultivar also has the most welcome tendency to create masses of perfectly formed flowers.

Japonica Miniatures

These smaller-than-usual flowers might appear at first glance to be more at home in the landscape of a child's dollhouse than anywhere else, but that's all part of their winsomeness. And they are even more appropriate as blooms for one's boutonniere than their larger counterparts. For me, the anemone form is unattractive except as a miniature. The smaller scale seems to leave no room for gaudiness. 'Tinsie' (with its red outer guard petals and white center), 'Bob's Tinsie' (brilliant red) and 'Tinker Bell' (white, striped pink and rose red) attest to the fact. I'll even put up with the names.

Other favorites: 'Fircone' (blood red semi-double in a refreshing fir cone form); 'Tammia' (white formal double with pink center and border) has incurred petals; 'Kuro Tsubaki' is a semi-double in cherry red with red stamens, while 'Black Tie' resembles a dark red rosebud. I

haven't yet met a miniature I haven't liked.

A Few Favorite Japonicas

These don't fit the *Camellia japonica* stereotype for me. They are exceedingly beautiful without the heavy hand and deserve to be known in a special context.

I acquired 'Unryu' on impulse after reading a catalog description of its strange zig-zag growth pattern, wherein at each leaf growth proceeds at a 45° angle in the opposite direction. But the plant surprised me as more than a novelty. Here were orderly tiered splays of burnished foliage, highly sophisticated for a japonica. It is the only camellia I dare not shape, except to capture one of its long, waxy rose bells, reminiscent of those of

the Chilean vine *Lapageria rosea*. Another, which masquerades even more so as that most desired of all vines is 'Kujaku Tsubaki', the peacock camellia. This is a graceful shrub with long, willow leaves, and every branch seems to be in place. Its pendulous, tubular deep rose red flowers are less open than those of 'Unryu', more like trombones to the trumpets of the latter.

One more favorite is 'Lily Pons'. After seeing it at a recent show, I left no stone unturned to locate a plant. Looking just like a water-lily with narrow, troughlike petals, it was a standout in a crowd of dressy beauties. And *en masse* the chiseled, star-shaped blooms are as striking on the plant as on the coffee table. ❧

COLD FACTS ABOUT CAMELLIAS

Tidewater Virginia is the furthest north that most camellias have proven hardy over the longer term. *Camellia japonica*, *C. x williamsii* hybrids and *C. sasanqua* are generally hardy. *C. reticulata* is barely hardy, and then only in protected sites. *C. granthamiana* gets damaged in exceptionally cold winters.

Reports on relative hardiness of the wood, foliage and (not always the same thing) buds are inconsistent. It is apparent that site, soil, general care and ripeness of the wood have a considerable bearing on hardiness. Camellias need a slightly acid soil. Part shade is best for *C. japonica* and *C. x williamsii*. *C. sasanqua*, an autumn bloomer, flowers best in full sun or very light shade. It is drought resistant once established but slightly less cold hardy than the winter or early-spring blooming *C. japonica*. Camellia roots cannot stand much freezing. A well-mulched, well-established camellia will survive where one newly planted, in a container, unmulched or exposed to wind may not.

Area reports on vegetative and bud hardiness can be found in the *American Camellia Yearbook for 1978*. The following is an extract from an article by W.L. Ackerman: "Camellias at the National Arboretum (Washington, D.C.), severely injured during the 1976-77 season, experienced even greater devastation during this past winter season. Late vegetative growth during the summer of 1977 was not sufficiently hardened off to withstand the onslaught of the second worst winter in the area in several decades. Among the various species, *C. oleifera* again showed the least damage, followed in order by *C. wabisuke*, *C. japonica*, *C. williamsii*, *C. sasanqua*, *C. sinensis* and *C. rusticana*. It was the final 'death blow' to all but a few of more than 120 representatives of 68 *C. sasanqua* cultivars. The few surviving plants include 'Pink Dauphin', 'Johnson's Dwarf' and 'Showa-No-Sakae'. It is doubtful that any *C. sinensis* or *C. rusticana* clones have survived."

Out of 60 cultivars of *C. japonica* tested by Polly Hill on Martha's Vineyard (Zone 6, winter low of -9°F) only 'Kumasaka' proved hardy. This cultivar also appears on a list of camellias being grown in New York City (where *C. japonica* survives in protected sites) and on most other lists of exceptionally hardy cultivars. 'Kumasaka' would seem to be the one to start with if you are uncertain whether or not you can grow camellias. ❧



Hill planting for good drainage

Dispelling the mysteries about . . .

HYDRANGEAS, THEIR ATTRIBUTES AND CARE

Christopher Lloyd

Adapted with permission from *THE WELL TEMPERED GARDEN*,
American edition by E. P. Dutton and Co., New York

We all know that from July onwards there are not so many flowering shrubs to choose for the garden. Our mainstay, then, are the hydrangeas. That rather makes it sound as though we have to restrict ourselves to a diet of bread-and-butter, with no jam or cake to liven things up till spring comes round again. But I do not regard hydrangeas in that light at all. For me they are a favorite shrub that happens to flower at a most convenient time when other shrub favorites have retired from the scene.

There are hydrangeas for all tastes. The mop-headed hortensias are undoubtedly

the most popular, but they are regarded, in refined circles, as crude, blatant, obvious, coarse, vulgar. In that case I have something of all those qualities myself. I do not like all these hortensias at all times and in all places, but they have a tremendous luxuriance and vitality that one cannot help admiring. In England you see them in every suburban front garden in every seaside resort, but they somehow manage to transcend their banal surroundings. They refuse to stay primly in beds but bulge and spill over, as if they had just risen like a yeast loaf.

The wild types of hydrangea are known



Jelena witch-hazel (*Hamamelis* x *intermedia* 'Jelena'), shown here encased in ice, blooms in midwinter.



Kerria (*K. japonica*), also available in double form, has bright green twigs all year.



Autumn fruits of linden viburnum (*V. dilatatum*) follow the late spring flowers.



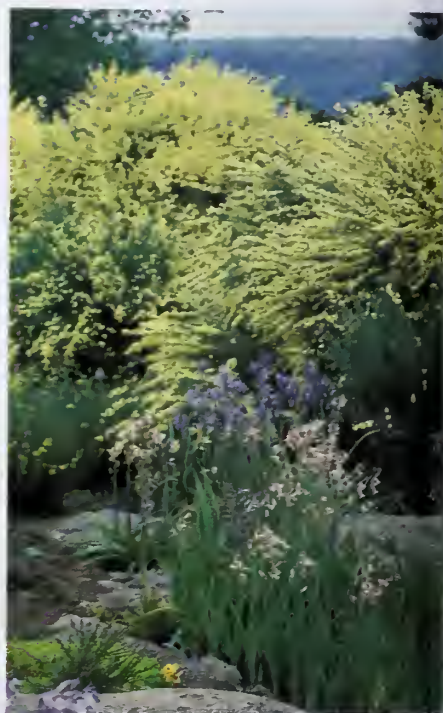
Korean rhododendron (*R. mucronulatum*), one of the few deciduous rhododendrons, flowers in late winter or early spring.



Noted for its procumbent growth habit, *Calluna vulgaris* 'Mrs. Ronald Gray' blooms from July through September.



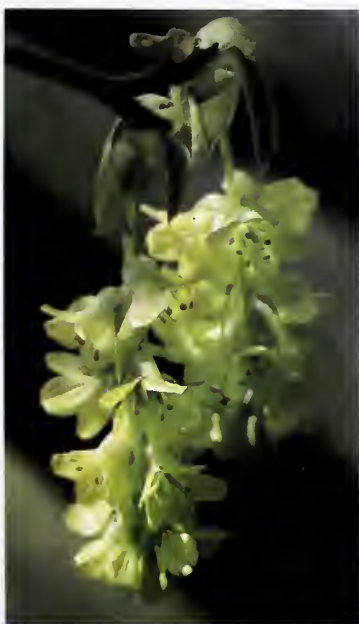
Fothergilla monticola, a medium-sized shrub with good autumn color, is especially striking when planted in front of evergreens.



The brooms (*Cytisus* sp.) vary with something for any sunny, well-drained blue Spanish blueberry.



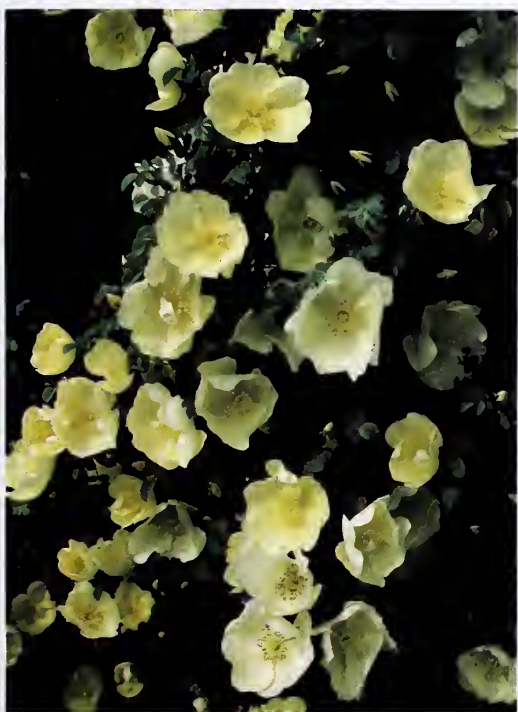
Japanese pieris (*P. japonica*), an evergreen, has flower clusters up to five inches long.



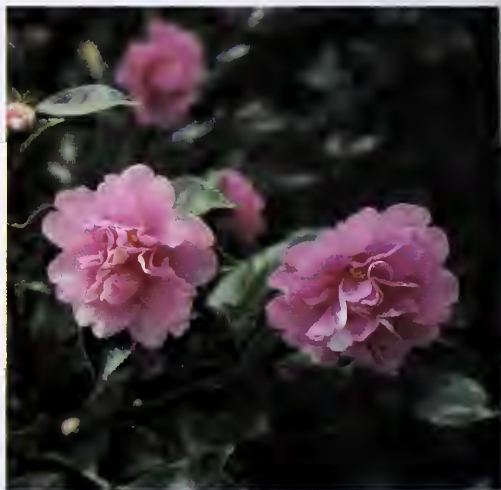
Fragrant winter-hazel (*Corylopsis glabrescens*), an April bloomer, is the hardiest species in its genus.



size and flower color, offering
e site. In foreground, pink and
ymion hispanica).



An early bloomer, the Father Hugo rose (*Rosa hugonis*) is one of the finest single yellow roses.



Above, clockwise from top, purple smokebush (*Cotinus coggygia* 'Purpureus'), *Hydrangea* 'Annabelle', bush cinquefoil (*Potentilla fruticosa*), variegated Siberian dogwood (*Cornus alba* 'Elegantissima'). Above right, *Hydrangea macrophylla* 'Blue Wave' is one of the best of the lace-cap types. Right, *Camellia sasanqua* 'Showa-No-Sakae'.



Rhododendron x 'Windbeam', a Nearing hybrid, is an exceptionally hardy semidwarf, growing to six feet in twenty years.

The tropical glory bush (*Tibouchina urvilleana*) a Brazilian evergreen, has silky, deeply creased leaves.

as lacecaps* and typically have flat heads consisting of a central area of tiny fertile florets and an outer ring of large, showy sterile florets. These are generally considered, by the general public, to be lacking, but are the only kinds worth growing, according to the sensitive (but self-conscious) man of taste.

Hardiness and Vigor

Many hydrangeas, alas, are none too hardy. Those that are best suited as pot plants are often the least reliable in the garden, so that many disappointments arise from the flowering hydrangea that was a present in a pot and which you subsequently planted in the garden. The trouble about the less hardy hydrangeas is that they never let you know just where you stand, by dying on you. What happens is that they grow luxuriantly all through the summer, making masses of sappy, leafy growth from ground level. These shoots never ripen (*i.e.*, toughen, harden) enough to carry them through the winter. They get frosted right back to the ground and the process starts all over again in the spring. If the shoots made in the summer can be carried alive through the winter, they will flower in the following summer. Otherwise not, or very little.

So you must choose your varieties accordingly. An experienced nurseryman will be able to help with advice on hardiness. . . . You can, at least, help yourself by not planting your hydrangeas till spring. Make sure that you buy a plant that has two or three woody branches on it. These branches will become woodier still, in your garden, during the plant's first summer and will have a decent chance of surviving their first winter. Having cleared that hurdle, its chances will become rosier each year as the shrub's bulk builds up and its old branches get tougher and more frost-resistant.

Second, vigor. If you are an impatient gardener (the chances are fifty to one on) you will buy the hydrangea that grows fastest into a good-sized shrub. It fills its allotted space and this was insufficient because, being an impatient gardener,

* Not to be confused with the viburnums with the same common name.

you planted it too close to its neighbors or to a path. What next? You cut it back. But in cutting it back you remove all its flowering wood. It reacts by making a mass of sappy young shoots and they probably all get frosted. No flowers. We are back where we started.

Pruning and Fertilizing

Never prune your hydrangeas by shortening their shoots back (except for some of the *H. paniculata* group and one or two other white-flowered species). The only pruning should be by thinning out. You crawl under your bush, in March, until you are near the middle of it and then you cut its weakest old shoots right to ground level. Over a period of many years, the average hydrangea needs to renew itself. By cutting away its oldest and least vigorous branches you admit light and space to the center of the bush and encourage the development of a few (not too many) new branches.

Now hydrangeas are hungry shrubs. They respond to good feeding. Give them a mulch of bulky organic manure or compost in the winter and a feed of general fertilizer in spring. Never feed them in the summer or you will encourage soft, frost-susceptible growth at the tail end of the growing season. You want to encourage growth in early summer, but ripening in late summer and autumn. Of course, hortensia hydrangeas are thirsty. I say "of course" because the shrub makes its needs so obvious, its flower clusters wilting and looking pathetic and reproachful if short of water. No one with any feelings will let thirst go unquenched.

Controlling Flower Color

Color variations in hydrangea flowers are so extraordinary and so capricious, even as from one part of a bush to another, that my advice, for anyone's peace of mind, is to accept them all, or nearly all, and to enjoy what comes. However, there are inevitably some colors that we prefer to others.

Let us forget about the whites for the moment. Among colored hydrangeas, the tendency is for flower coloring to vary according to the acidity of your soil. A



Flower color of *Hydrangea macrophylla* can be varied by regulating the acidity or alkalinity of the soil: more acid, more blue; more alkaline, more pink or red.

flower that comes red on alkaline soil will be violet on a very acid soil and something in between on neutral soils. A flower that comes pink on alkaline soil will come blue on very acid soil and some shade of mauve where the soil is slightly acid or neutral. This is irrespective of variety. If you say to a nurseryman, "I want a blue hydrangea," he can sell you one with a name like 'Bluewave', but cannot guarantee that the flowers will come blue in your garden. "All right," you say, "I'll buy one that's flowering in a pot and that definitely is the shade of blue I want." You do so, but next year your paragon flowers pink, in your garden. People either find this easy to understand or quite impossible, so I shall not labor the reasoning.

It is very easy to change the coloring of your hydrangea's flowers from blue to pink or from violet to red. All you have to is to add lime to the soil and make it alkaline.

To make alkaline soil acid is practically impossible. Those who live on chalk or lime and want a blue hydrangea had best grow it in imported, acid soil in a tub and water it with soft rain water. On soil that is neutral or slightly acid, producing mauve flowers in your hydrangeas, you can hope to make them blue by feeding them with iron and aluminum salts. On too alkaline a soil, many hydrangeas grow unhappily and show their distress by turning yellow in their leaves. Matters can be improved by adding iron chelates.

You cannot change the color of a white hydrangea, but it is normal for the flowers of white hydrangeas exposed to sunlight to turn pinkish or even red, as they age. In shade, they turn a curious and metallic green, on aging, and this also holds for colored varieties. But the weather must be good, while this is going on, in autumn, otherwise the entire flower head will rot, as it ages, instead of taking on those seductive hues that are so valuable to flower arrangers. ❀

IRONCLAD SHRUBS FOR URBAN LANDSCAPES

Gary L. Koller

Life in cities is often stressful for people, but have you ever considered that it also might be less than ideal for plants? Space is frequently the most critical factor. In a park, for instance, there just may not be enough room for large sprawling shrubs as well as the wealth of human activities such as picnics, and for play areas and space to sunbathe. As a result, plants which outgrow their bounds are brutally hacked, chopped and mauled at almost any time of year by well-meaning individuals who give little consideration to how "pruning" will affect the health, vigor and flowering potential for future years.

Shade is an environmental condition which is prevalent in older neighborhoods. It can be caused by mature trees with dense canopies such as Norway maples or by nearby buildings. People often select the wrong plants for specific landscape situations, not knowing that some require full sun while others are more tolerant or, in fact, grow best in some shade.

City soils can be a problem for they usually lack organic matter; they can vary in pH from acid to alkaline; they may be compacted by incessant foot or vehicular traffic and, frequently, they have been invaded by remnants of old driveways, concrete, abandoned building materials or discarded chemicals. In many areas the air is filled with dust, aerial-borne de-icing salts and atmospheric pollutants.

Life for the shrub is tough! But it can also be difficult for the owners who are hampered by lack of knowledge about caring for plants. In addition, most city people are busy and wish to spend little time thinking about the landscape or

maintaining it. So, this list of ironclad shrubs has been developed, using the following criteria:

First, people want to improve the appearance of their home or office with living plants which will be undemanding as to type or quality of soil, tolerant of sun or shade and able to withstand atmospheric pollutants. Second, the plants must survive pruning which may range from inept to brutal, as well as tolerate minimum maintenance (little or no fertilizing, watering or spraying). Third, the plants should have a long life and robust appearance. Although these plants have been selected primarily for toughness and durability, some have superb flowers, fruit or autumn color.

Before choosing shrubs, keep in mind the two most important criteria. First, *size*. Does the shrub possess the potential to stay within the space you wish it to occupy? The dimensions of a particular shrub will vary somewhat depending on climate, but there are general ranges. Each kind has an essentially different mature height and spread, with some being as small as three feet tall by three feet (or less) wide, others varying upwards to giants which become twelve to fifteen feet tall and as much across. Just determining this one characteristic can save much maintenance time or expense in the form of pruning.

The second consideration is *environment*. Is your site one of full sun (six or more hours of full, direct light) or is it shaded? You will have greatest success by selecting plants which thrive under those conditions which presently exist in your landscape.

Botanical and common names		Size		Uses		Tolerances						Landscape attributes				Prune						
		Height, in feet	Spread, in feet	Specimen	Hedge	Mass planting	Bank stabilization	Min. temp., °F	High pH	Salt	Drought	Wet soils	Sun	Light shade	Moderate shade	Flowers	Fruit	Autumn color	Deciduous	Evergreen	Drastic	After flowering
Table 1. Large shrubs (12 feet tall or more)																						
Caragana arborescens, Siberian peatree		15-20	12-18	X				-50	X	X	X	X	X	X		X	X		X		X	X
Hamamelis virginiana, Common witch-hazel		15-20	15-20	X		X		-20	X			X	X	X		X	X	X	X		X	
Hydrangea paniculata, Panicle hydrangea		10-20	10-20	X				-20	X	X	X	X	X	X		X						
Ligustrum amurense, Amur privet		12-15	8-10	X		X		-30	X	X	X	X	X	X		X	X					
Lonicera maackii, Amur honeysuckle		12-15	10-15	X		X		-50	X	X	X	X	X	X		X	X				X	X
Magnolia stellata, Star magnolia		10-15	10-15	X				-20	X		X	X	X	X		X	X				X	X
Rhus copallina, Winged sumac		15-25	15-25	X		X		-30	X	X	X	X	X	X		X	X				X	X
Rhus typhina 'Laciniata', Cut-leaved sumac		15-25	15-25	X		X		-30	X	X	X	X	X	X		X	X				X	X
Tamarix pentandra, Five-stamen tamarix		10-15	8-12	X		X		-50	X	X	X	X	X	X		X					X	X
Table 2. Medium shrubs (generally 6-12 feet tall)																						
Elaeagnus multiflora, Cherry elaeagnus		6-10	6-10	X	X	X	X	-20	X	X	X	X	X	X		X	X		X		X	
Euonymus alata 'Compacta', Compact winged euonymus		6-10	6-10	X	X	X	X	-30	X	X	X	X	X	X				X			X	
Euonymus kiautschovica (patens), Spreading euonymus		8-10	8-10	X				-10	X	X	X					X	X					
Forsythia x intermedia, Border forsythia		8-10	10-12	X	X	X	X	-10	X	X	X	X	X	X		X	X					
Fothergilla major, Large fothergilla		6-10	6-10	X	X	X		-10								X	X					
Hibiscus syriacus, Rose-of-Sharon		8-12	6-10	X	X			-10	X	X						X						
Ilex verticillata, Winterberry		8-12	8-12	X	X			-10	X	X		X	X	X		X	X				X	X
Kolkwitzia amabilis, Beautybush		6-10	6-10	X	X	X		-20	X	X	X	X	X	X		X	X				X	X
Lonicera fragrantissima, Fragrant honeysuckle		6-10	6-10	X				-15	X	X	X	X	X	X		X	X				X	X
Lonicera tatarica, Tatarian honeysuckle		10-12	10-12	X		X		-30	X	X	X	X	X	X		X	X				X	X
Malus sargentii, Sargent crabapple		6-8	6-12	X		X	X	-20	X	X	X	X	X	X		X	X				X	X
Myrica pensylvanica, Bayberry		6-12	6-12	X		X	X	-50	X	X	X	X	X	X		X	X				X	X
Philadelphus coronarius, Mock-orange		10-12	10-12	X		X	X	-20	X	X	X	X	X	X		X	X				X	X
Physocarpus opulifolius, Ninebark		5-9	6-10	X	X	X	X	-50	X	X	X	X	X	X		X	X				X	X

SHRUBS HAVE A SEX LIFE, TOO

Have you ever bought a holly and waited impatiently for branches wreathed with berries . . . and waited . . . and waited? Then you need to know what *dioecious* means, and to which plants it applies. Briefly, plants fall into the following sexual categories:

Bisexual or hermaphroditic. Each flower is "perfect," having functioning male (stamens) and female (pistil) parts. Hermes, remember, was not only fleet-footed messenger of the gods but also a fertility god, and Aphrodite was goddess of love. Plants with hermaphroditic flowers need no marital partner. Fortunately the majority of shrubs fall into this category.

Unisexual flowers have either stamens or pistils, not both. If both staminate and pistillate flowers, though separate, are borne on the same shrub, the shrub is termed *monoecious* and, again, needs no partner. When, however, a shrub bears only staminate, or only pistillate flowers, it is termed *dioecious*. One familiar example is the holly. If it is a male, then by no way short of a miracle can it bear berries. If it is a female, berrying potential is there, but lacking a male pollen partner it will be barren. Pollen can travel, via wind or bee, an indeterminate but lengthy distance, and there may be a pollen partner for the lady in a neighbor's garden, but don't count on it.

There are exceptions to most rules. Virgin births are not possible in hollydom, but some hollies (notably *Ilex cornuta* 'Burfordii') do berry freely without being pollinated. The seeds are not viable—but this does not detract from their ornamental quality.

Holly is the best known example of a dioecious shrub, but it is not the only one. *Aucuba japonica* is dioecious. The 'Variegata', with spotted leaves, is usually female, though a similar male form exists. Gold-blotched 'Crotonifolia' is male, and 'Picturata', with a large gold central patch instead of freckling, female. The plain green leaves of such kinds as 'Salicifolia' (female) make a better background for the large, coral-red berries than the mottled kinds. Other dioecious shrubs include *Baccharis*, *Hippophae*, *Lindera benzoin*, *Myrica*, *Rhus* (also polygamous), *Skimmia* species (except *reevesiana*), *Taxus*, *Ruscus* (usually), and *Shepherdia*.

Fortunately, shrubs are not monogamous. One male, sultanlike, can serve a small harem of females. Help the wind play Cupid by planting the ladies leeward of the male. If you have space for only one shrub you could try grafting or budding a male branch onto a female shrub. We even know people who at flowering time cut a branch of a male holly from a neighbor's garden and hang it on the female in their own garden.

When buying berrying dioecious shrubs, don't put up with *caveat emptor* (buyer beware). Insist on a written guarantee that you have been sold both male and female. If you buy in autumn, berry-laden, one sex is assured. A barren bush in the row is probably, but not certainly, male. If buying by mail look for such female clones as *I. verticillata* 'Christmas Cheer', but buy from nurseries supplying also the pollen partner.

Lest all this suggest that male dioecious shrubs are merely utilitarian, not so. Where decorative fruits are not a consideration, the staminate form may be what you want. Such male forms of *Garrya elliptica* as 'James Roof' have the longest catkin tassels; male clones of *Skimmia japonica* are usually more attractive in flower than females, especially such selections as 'Rubella', with mounded heads of dark pink buds through winter, opening into white flowers greatly enhanced by the yellow anthers. In most species of willow the male catkins are more showy.

There is one more complication in the sex life of shrubs. Some genera are *polygamous*—*Pernettya*, *Callicarpa* and *Symplocos*, for example. This means that the flowers of an individual shrub might be (a) bisexual, (b) staminate, (c) pistillate, or (d) various combinations of these flower types on the same plant. Thus your purchased plant, if a seedling, could be a real pig-in-a-poke. With plants known to be polygamous it is often wise to plant in groups. Grouping seems to foster more abundant berrying in many *Viburnum* species, particularly the dwarf, blue-berried *V. davidii*. ❧

Winter is harsh, so choice of plants
and site takes on special importance . . .

FLOWERING SHRUBS FOR NEW ENGLAND

Gregory D. Armstrong

A major portion of the natural landscape in New England is made up of trees and shrubs, so the use of shrubs in a garden helps it to blend with its surroundings. Many shrubs native to the area make excellent ornamentals, such as mountain-laurel, some azaleas and winterberry (*Ilex verticillata*) but, as with gardeners all over the world, we like to increase our choices by introducing plants from other regions and other countries. Not all non-native plants, however, will withstand New England conditions.

New England's relatively high atmospheric moisture and fairly even distribution of precipitation during the year, coupled with the predominantly acid soils, allows us to choose from a wide range of flowering shrubs. The main limitation is low winter temperatures, which vary throughout our region but which sometimes can rank with the coldest in the country.

Not surprisingly, New England gardeners are especially interested in how particular plants survive winter. The hardiness of a shrub is an inherited characteristic, and relatively uniform for each kind, though some cultivars have been selected for greater-than-usual hardiness. Hardiness is affected not only by the minimum winter temperature, but also by the location of the shrub in the garden. Marginally hardy plants become more vulnerable if exposed to strong winter winds. Broad-leaved evergreens such as rhododendrons, pieris and leucothoe are often injured if exposed to winter sun, so a northern exposure or winter shade is desirable.

Anything that reduces the health and vigor of a plant will make it more susceptible to winter injury. Plants growing in overly wet or dry soils, or in too much shade, and plants suffering from nutrient deficiencies are more likely to be damaged by low temperatures. The reduced vigor of the plant correlates with a reduced build up of sugars because the sugars act as an "anti-freeze" ingredient in the plant's tissues. In a recent winter of exceptional cold some of the flowering dogwood trees were killed outright, although the majority suffered only minor setbacks. On investigation it appeared that only dogwoods growing in dense shade or on poor soils were killed.

In some instances the vegetative part of the plant is perfectly hardy, but the flower buds are tender as, for example, with forsythia and Japanese quince. Often, only the flowers that come from buds below the snow line will open, while the majority are frozen. For areas north of Zone 5 many of the best-flowering forsythias are not worth planting because of this bud tenderness. *Forsythia ovata* is more bud hardy in cold areas than either *F. x intermedia* or *F. suspensa*, but the

Mountain-laurel (*Kalmia latifolia*) usually has pink-tinged flowers, but variants with red buds or cinnamon bands are increasingly available.



Herman Ginner

Name	Hardiness	Approx. height in 10 years	Other qualities		Evergreen or nearly-so
	Zone		Fruit	Fall color	
<i>Clethra alnifolia</i> , Summersweet	3	4'		X	
<i>Cornus mas</i> , Cornelian-cherry Dogwood	4	15'	X	X	
<i>Cotoneaster horizontalis</i> , Rockspray	4	3'	X	X	X
<i>Cotoneaster multiflorus</i> , Many-flowered Cotoneaster	5	6'	X		
<i>Deutzia gracilis</i> , Slender Deutzia	4	3'			
<i>Forsythia x intermedia</i> , Border Forsythia	5	9'			
<i>Fothergilla major</i> , Large Fothergilla	5	6'		X	
<i>Hamamelis mollis</i> , Chinese Witch-hazel	5	15'		X	
<i>Kalmia latifolia</i> , Mountain-laurel	4	4'			X
<i>Kerria japonica</i> , Kerria	4	4'			
<i>Leucothoe fontanesiana</i> , Leucothoe	4	4'			X
<i>Magnolia stellata</i> , Star Magnolia	5	5'		X	
<i>Pieris japonica</i> , Japanese Pieris	5	5'			X
<i>Prunus tomentosa</i> , Manchu Cherry	2	9'	X		
<i>Rhododendron calendulaceum</i> , Flame Azalea	5	8'			
<i>Rhododendron carolinianum</i> , Carolina Rhododendron	5	4'			X
<i>Rhododendron catawbiense</i> , Catawba Rhododendron	4	5'			X
<i>Rosa hugonis</i> , Golden Rose of China	5	7'			
<i>Rosa rugosa</i> , Rugosa Rose	2	6'	X	X	
<i>Spiraea x vanhouttei</i> , Vanhoutte Spirea	4	6'		X	
<i>Viburnum dilatatum</i> , Linden Viburnum	5	5'	X	X	
<i>Viburnum plicatum</i> var. <i>tomentosum</i> , Doublefile Viburnum	4	6'	X	X	

flowers are smaller and fewer in number.

Soils in the Northeast tend to be slightly acid and are suitable for most shrubs, but for ones needing a decidedly acid soil, such as rhododendrons and azaleas, it may be necessary to add peat or other acidifying substances at planting time. Flowers of course should not be the

only criterion for choosing a shrub. Consider also size, shape, foliage texture, autumn color, fruiting characteristics and general tidiness of the plant.

To help you make your selections, consult the Chart for some of the best flowering shrubs for New England, their hardiness, height and ornamental qualities. ❀

SHRUBS TO EXCEL IN THE MID-ATLANTIC STATES

Richard Weir, III

Although some temperature variation exists within our region (Zone 6, Arnold Arboretum Map), the weather on the whole is mild enough to grow many shrubs too tender for colder regions, while cooling ocean breezes allow many of the northern natives to perform well in our coastal areas. Soil and exposure, however, are quite variable. Some areas have sandy, well-drained soil, others clay. Many of the rich farming areas are blessed with productive silt loams. In some locations the soils are deep, in others the tillable limit may be only six inches. Although soils are generally acidic, there are pockets where the pH reaches the neutral point (7.0). Exposures also vary—from the windswept, salt-laden shores of Long Island and the open flat plains of central New Jersey, to the low hills and protected valleys of inland Connecticut and Maryland. A wide range of plants can be grown in the protected areas, a more limited selection along the exposed shore.

Examine the soil, exposure, elevation, drainage, degree of shade and native flora before choosing shrubs for the garden. Then determine where the plants are needed, and which ones will best fit the location. If less than satisfactory growing conditions exist—excessive shade, poor drainage or salt spray—try to select shrubs naturally adapted to such conditions. Otherwise, the site must be altered to suit the plants, and this means a lot more work.

Pertinent facts to be gathered about specific shrubs might include: rate of growth, ultimate height and spread, pollution tolerance, pruning requirements, and relative freedom from insects and diseases. Your county Cooperative Extension Office, garden center or botanic garden may have lists of recommended shrubs for different sites in your area. Visit and observe labeled shrub collections to get a better feel for the plants in question.

Most of the shrubs described are available at nurseries and garden centers. There are a few gems that will not be easily found but are worth the search. Once you become the proud owner of these new plants, make sure they are properly planted. Rapid establishment in their new location is a major key to success. Here are some favorites for the area:

Abelia x grandiflora, Glossy Abelia. A hardy, semi-evergreen shrub with clusters of white, pink-flushed flowers from July until killing frost in autumn. Glossy green foliage and persistent bronze sepals add to the pleasing effect. Height to five feet.

Aronia arbutifolia, Red Chokeberry. An upright shrub to eight feet with dainty clusters of single white blossoms, shiny foliage, orange-red fall color, and bright red berries which attract birds. This chokeberry colonizes readily in low, wet places. It tolerates a wide range of soils but grows best in a damp location in sun or light shade. Not to be confused with chokecherry (*Prunus virginiana*), a weedy shrub or small tree.

Berberis verruculosa, Warty Barberry. A compact low-growing evergreen to three feet with spiny leathery foliage which is dark lustrous green above, white beneath. Refined small yellow flowers appear in May, followed by fruit which ripens to blue-black in autumn. This and two similar evergreen kinds, the three-spine barberry (*B. triacanthophora*) and Chenault barberry (*B. x chenaultii*), make excellent plants for house foundations or for the foreground of a shrub border.

Cornus, Shubby Dogwoods. Not all dogwoods are trees. Several of the multi-stemmed members of the *Cornus* genus adapt to adverse growing sites. Those that spread by stolons are useful for holding soil on exposed banks or alongside streams. All have flat clusters of small, creamy white flowers and conspicuous white or blue-black fruits, but it is the



The flower clusters of redvein enkianthus (*E. campanulatus*) turn upwards when spent and then resemble little carriage lanterns.

highly colored winter twigs that make the following shrubs outstanding: *Cornus alba* (red), *C. a.* 'Sibirica' (bright coral red), *C. sericea* (dark red), and *C. s.* 'Flaviramea' (brilliant yellow). Prune them heavily in early spring for brightest twig color the following winter.

Cotinus coggygia, Smokebush. See page 64.

Cyrilla racemiflora, American Cyrilla. For humus-rich soil in a protected location, this southern native, which can grow to ten to twelve feet, is well worth seeking out. The bright, shiny foliage looks evergreen but doesn't persist through winter. Instead, it gradually turns from green to orange to scarlet, providing a kaleidoscope of color. Distinctive slender racemes of small white flowers appear at the base of the current year's shoots in July. They are often partly hidden by the foliage, but the long-lasting yellowish seed capsules are decorative later in the season as the leaves begin to thin.

Deutzia gracilis, Slender Deutzia. This graceful low grower (to three feet) is one of the best deutzias because of its dense, compact habit and myriad of showy white

flowers. It is perfectly hardy here and requires far less pruning than others of the genus. For foundation planting or flower border, individually or grouped in threes, it is compatible with almost any plant.

Enkianthus campanulatus, Redvein Enkianthus. Eventually a tall shrub, this member of the Heath Family benefits from the same cultural treatment and soil given to rhododendrons. It is deciduous, of tiered branching habit, with small bell-shaped flowers in pendulous bunches. The flowers are muted colors of yellow and orange with red veins, best enjoyed at close range. Enkianthus is attractive when planted on a rise so the flowers can be viewed from below. Autumn color is variable, but often brilliant orange or scarlet.

Fothergilla monticola, Alabama Fothergilla. Curiously, fothergillas are overlooked by many gardeners. Closely related to witch-hazel, this species and *F. major* are both excellent upright-branched shrubs, gradually reaching six to eight feet in height. Flower spikes are white, in terminal heads that appear just as the leaves begin to open. The plant is striking

again in autumn, when the foliage turns brilliant orange, yellow and red. Here is an ideal shrub for the background or corner of a foundation planting, or in front of evergreens, in open sun or light shade.

Ilex, Holly. Lack of space precludes full mention of these fine plants, which are not grown for flowers but for the brightly colored, usually red, fruits that follow on female plants (males of the same species or group are needed for pollination). Winterberry (*I. verticillata*), which loses its foliage in autumn, has fruits persisting to Christmas. Excellent evergreen hollies, and good companions for ornamental flowering shrubs, include *I. x aquipernyi* 'San Jose', the Meserve hybrids (e.g., 'Blue Angel', 'Blue Prince'), and the tall-growing longstalk holly (*I. pedunculosa*), which has foliage like mountain-laurel.

Leucothoe fontanesiana (*catesbaei*), Drooping Leucothoe. A broad-leaved evergreen appreciated for its picturesque arching branches and lustrous, leathery foliage. Wider than tall (four feet maximum here). Needs acid soil. Increases in size by underground stems. Short pendent racemes of white bell-shaped flowers appear in June. Foliage turns beet red to bronze-purple in fall and winter if located in sun or light shade.

Pieris japonica, Japanese Pieris or "Andromeda." A deservedly popular evergreen with shiny dark green foliage that shows off the drooping clusters of pale green or red flower buds from fall until the following spring. Then the long-lasting white bells open, and thereafter the attractive new terminal growth appears. The young leaves are a coppery color, or fiery red in the hybrid 'Forest Flame'. In recent years a variety of cultivars have been selected for foliage and flowers. *P. j.* 'Variegata' is a delightful compact grower with uniformly white-margined leaves. Pieris does best in a lightly shaded area, where it seems less prone than in sun to lace bug injury.

Potentilla fruticosa, Bush Cinquefoil. Many cultivars of this little (three foot) shrub are available. Adaptability, ease of maintenance, and long period of bloom in summer make it a choice of mine, al-

though further south it does not perform well. Colors range through shades of orange and yellow to white. One cultivar, 'Red Ace', may have red flowers, but in some gardens they, or a proportion of them, will be orange. If given plenty of sun this shrub will stay compact, bloom prolifically, and tolerate drought and poor soil. It is most attractive planted in groups of three or five, or in masses.

Rhododendron species and hybrids, both evergreen and deciduous (including azaleas), deserve an article by themselves and in fact are treated separately in the BBG Handbook, *Rhododendrons and Their Relatives*. Although, given acid soil, they are more adaptable here than given credit for, they grow best in dappled shade in a humus-rich soil. The deciduous species (many of them native to the eastern United States) are attractive in many locations, including mixed border plantings, for their colorful spring flowers and autumn foliage. Flame azalea (*R. calendulaceum*) has orange, yellow or scarlet blossoms in early June, royal azalea (*R. schlippenbachii*) fragrant pink flowers in May, and sweet azalea (*R. arborescens*) extremely fragrant white flowers in June. The Exbury, Ghent and Knap Hill hybrids, which also lose their leaves in autumn, come in a wide range of colors, including bright yellow, gold, striking pink and salmon and brilliant orange-reds.

Evergreen rhododendrons range from small-flowered dwarfs to very large shrubs with massive clusters of blossoms. A few I find exceptional include the Carolina rhododendron (*R. carolinianum*), P.J.M. Hybrids, Dexter hybrids (based on *R. fortunei*), and some of the ironclad cultivars of catawba rhododendron (*R. catawbiense*). My only frustration with azaleas and rhododendrons is the overuse of certain cultivars when there are so many other desirable kinds. If they are hard to find, join a local chapter of the American Rhododendron Society and take advantage of their plant sales.

Viburnum. Among numerous attractive viburnums I rate highly the Siebold (*V. sieboldii*), fragrant snowball (*V. x carlcephalum*), tea viburnum (*V. setigerum*, both the red-fruited species

and apricot-colored 'Aurantiacum') and linden viburnum (*V. dilatatum*).

The shrubs described above are among my favorites for this region, but everyone has his or her own preference for particular plants, and own ideas about how

to arrange them in the home landscape. By studying books and visiting botanic gardens and arboreta, the gardener becomes better able to make a wise choice, thereby ensuring pleasure for years to come. ❧

PART SHADE PREFERRED

What can I grow in the shade? This is an often-asked question to which there is no simple answer. There are many degrees of shade, and other factors must also be considered, such as root competition from trees and hedges, or atmospheric pollution where the shade comes from city buildings. Described here are the main kinds of shaded sites likely to be encountered.

Dense year-round shade under low-branched, closely planted evergreens. No flowering shrub can be grown unless the trees are thinned or lower branches removed to let in light. English ivy is worth trying as a ground-cover.

Dense summer shade under closely planted, low-branched deciduous trees. Few if any flowering shrubs can be grown (and under such surface-rooting trees as beech and maple, little else) without constant watering, fertilizing and replenishing the surface mulch. If a root-free surface layer and adequate moisture exist or can be provided, many spring-flowering woodland wildflowers can be grown. Shrubs worth trying (note that not all are ornamental in bloom) are: *Aucuba*, leatherwood (*Dirca palustris*), *Fatsyhedera*, *Euonymus*, witch-hazel (*Hamamelis virginiana*), hills-of-snow and oakleaf hydrangeas (*H. arborescens* 'Grandiflora', *H. quercifolia*), *Leucothoe*, privet (*Ligustrum*), *Mahonia*, cherry-laurel (*Prunus laurocerasus*), alpine currant (*Ribes alpinum*), jetbead (*Rhodotypos scandens*), butcher's-broom (*Ruscus aculeatus*), *Sarcococca*, *Symphoricarpos*, *Spiraea arguta*, *Viburnum acerifolium*.

Dappled shade under widely spaced, high-branched trees. This is an ideal condition for a great range of flowering shrubs, especially evergreens. Provided, again, that the trees are not of a kind to make dense mats of surface roots, all shrubs recommended for part shade will thrive. If the trees are deciduous, however, winter burn may occur on evergreen shrubs exposed to sun in the colder months.

North-facing walls. Here there is plenty of light but no direct sun. A decided advantage is the freedom from root competition. Most of the shrubs recommended for part shade will grow well here but may flower less freely than they would in filtered shade or if facing east. Where you live makes a difference. *Camellia sasanqua* needs a lot of sun anywhere. However, in the Southeast, *C. japonica* flowers well against north walls, but in Seattle probably not.

East-facing walls provide gentle morning sun (acceptable to all shrubs) and afternoon shade. In the Southeast this is an ideal site for azaleas and all shrubs wanting part shade. Because frosted flowers that are thawed quickly by morning sun are destroyed, east-facing sites are not a good place for azaleas and camellias in areas where late spring frosts occur.

If the shrubs facing north or east are backed not by a wall but by trees (edge of woodland) or a hedge, the conditions are the same except that there may be root competition.

West-facing sites. Although west-facing sites are shaded in the morning, afternoon sun is very hot and such sites count as "full sun" for shrub selection purposes.

Local observation is important. Many shrubs that will grow in full sun in New England or Oregon may need part shade in the Southeast. *Hydrangea macrophylla*, for example, does best facing north or east. ❧

*In addition to the favorites,
there is a wealth of fine uncommon . . .*

FLOWERING SHRUBS FOR THE SOUTHEAST

Fred C. Galle

The first impression of Southern gardens is of evergreens—boxwood, camellias, evergreen azaleas and hollies, of which there are many species and cultivars. While these are the green foundation blocks, a number of other flowering shrubs are grown. Still more deciduous sorts would be welcome in our gardens because they offer variety in branching habit and stem coloration.

Gardeners in the Southeast have a great choice of flowering shrubs because of the climate. Winter lows range from 0°F in the coldest parts of the Southeast to a few degrees above freezing in the warmest. There are in fact regional climates within this large area, which is noted in general for its long growing season with high temperatures and frequent drought. Winter temperatures, though comparatively mild with only light snows in the mountains and in the northernmost regions, fluctuate considerably. A sudden drop following a mild period can cause plant damage which may not become apparent until late spring or summer.

Camellias and Azaleas

Camellias offer flowers from fall until April. In the Deep South the entire range of *Camellia japonica* cultivars can be grown, but in the cooler areas the fall- or late-winter-flowering ones should be chosen. The single-to-double flowers of fall-blooming *C. sasanqua* are also important to the landscape but, contrary to popular belief, this species is not as cold hardy as *C. japonica*. For more information on camellias, see page 36.

The gardens, streets and parks of many southern cities are noted for spectacular displays of azaleas. With proper selection of cultivars it is possible to have extensive flowering from early April through early June. First to bloom are usually the Kurume hybrids and the less hardy

Southern Indian hybrids. Then come the mid-season Glenn Dales and Back Acre hybrids and last the Satsuki hybrids. These have very large flowers and difficult-to-pronounce Japanese names. Shade, especially from noon on, is best for azaleas, and particularly important for the late-flowering cultivars. New hybrid groups coming into use are the Robin Hill (mid-season), North Tisbury (see page 25) and Linwood hybrids (hardy, early to mid-season types). In many areas such large evergreen rhododendrons as 'Cynthia', 'Kate Waterer', 'Blue Peter' and 'Scintillation' are being grown successfully. Contact members of the American Rhododendron Society in your area to learn of suitable cultivars.

Native species of azaleas are becoming more in demand. Plants available are no longer collected from the wild but are nursery-propagated from seed or cuttings. Rhododendrons *canescens*, *atlanticum*, *vaseyi*, *arborescens*, *austrinum*, *calendulaceum*, *flammeum* (*speciosum*) and *prunifolium* encompass a color range of white, pale to deeper pink, yellow, orange and flame. All are deciduous, many are extremely fragrant. An important consideration is that native azaleas have so far proved resistant to the petal blight disease that often destroys the blooms on the Japanese evergreen azaleas.

Various Evergreens

Broad-leaved evergreens noted for attractive fruits include the Chinese holly (*Ilex cornuta*), its cultivar 'Burfordii' (unusual in that it sets fruit without pollination), and the native yaupon (*I. vomitoria*); also aucubas, pyracanthas and heavenly-bamboo (*Nandina domestica*). *Nandina* 'Harbour Dwarf' is a cultivar of low and spreading habit useful for ground cover. Another cultivar, 'Nana Purpurea', makes dense hummocks of foliage that



Cherry-laurel (*Prunus laurocerasus*) can grow quite tall. Low growers such as 'Schipkaensis' and 'Otto Luyken' are usually better suited for today's gardens.

turns cardinal red by Christmas. This *Nandina* is one of the brightest things on the winter scene, but it does not bear berries. Alexandrian-laurel (*Danae racemosa*), a woody member of the Lily Family, is an excellent orange-fruited dwarf evergreen, three feet or less in height. This shrub from southwestern Asia performs best in moist shade. The apparent leaves are actually modified branches.

Other popular evergreens include mountain-laurel (*Kalmia latifolia*) and the fall-flowering, very fragrant *Osmanthus x fortunei*, as well as holly-leaf osmanthus (*O. heterophyllus*) and *O. fragrans*. Cherry-laurel (*Prunus laurocerasus*) grows very tall (to eighteen feet), but there are cultivars of low and spreading habit such as 'Otto Luyken'.

Abelia x grandiflora is the most adaptable and long-flowering evergreen for the Southeast, best in sun but also doing well in part shade. In warm climates it can attain ten feet, but cultivars 'Prostrata' (white) and 'Sherwoodii' (pearly pink) seldom exceed three feet. *Abelia* 'Edward Goucher' has larger flowers of a brighter pink and attains about five feet. *A.* 'Francis Mason' has flowers of very pale pink and leaves variegated in cream, yellow, green and dark red.

Semi-evergreens include *Viburnum x burkwoodii*, which is early-spring-

flowering and delightfully fragrant. It is an asset in any garden. This large shrub needs part shade. *Loropetalum chinense*, of the Witch-hazel Family, blooms in spring with the Kurume azaleas. Growing to twelve feet in height but usually less, it has spidery white flowers which are uncommonly attractive. The two-inch-long oval leaves are evergreen in the warmest areas, semi-evergreen in Zone 8, and sometimes entirely deciduous in the Baltimore area. *Loropetalum* makes a good background for azalea plantings.

Crape-myrtle, Hydrangeas

Crape-myrtle (*Lagerstroemia indica*) is so closely associated with our area that it is often referred to as the "lilac of the South," though it is native to China and botanically a closer kin of loosestrife (*Lythrum*) than lilac. It is a large deciduous shrub or small tree, noted for its handsome snake-barked trunk formation and for the huge terminal panicles of white, pink, red or purple flowers, showy from early to late summer. A great number of cultivars, including dwarfs and even hanging-basket sorts, have been named.

There are also countless cultivars of flowering quince (*Chaenomeles*) for early spring bloom. Some flower throughout the winter months, in warm spells. There

are oranges, whites, pinks and reds, singles and doubles.

The native oakleaf hydrangea (*H. quercifolia*) is a handsome plant for use in masses, preferably in part shade, even dry shade. Two kinds of flowers comprise the inflorescence, inconspicuous fertile ones, and the four-sepalled sterile flowers that make the twelve-inch-long pyramidal panicles of early June so ornamental. In the cultivar 'Snowflake' the sterile flowers are multi-sepalled. The foliage of oak-leaf hydrangea usually turns red and orange in fall.

The peegee hydrangea (*H. paniculata* 'Grandiflora'), so useful for late-summer

bloom and so common in older gardens, is now being displaced by such forms as 'Tardiva', which has a more refined flower cluster. The French or hortensia hydrangeas with their rounded clusters do extremely well in moist shade, and the bright blue kinds usually stay that way on the acid soils. Should they turn pink (as they usually do on alkaline soil), a light sprinkling of aluminum sulphate over the root area, applied when the ground is moist and then well watered in, will often restore blueness. The lacecap kinds such as 'Blue Wave' are admired when seen but, being less readily available, are less frequently planted. ❀

HYDRANGEAS FOR AMERICAN GARDENS

Hydrangea paniculata. (Zone 3-4). Large shrub or small tree, from Japan and China. *H. p.* 'Grandiflora' is the popular peegee hydrangea. Massive heads of white florets, fading to pink, in late summer. 'Tardiva', with more graceful pyramidal flower clusters, blooms in September.

Hydrangea arborescens. (Zone 4). Three to four feet. The species itself, native from New York south, is seldom grown. *H. a.* 'Grandiflora' is the snowball-flowered hills-of-snow hydrangea, blooming in midsummer. 'Annabelle' is an improved selection with larger clusters opening two weeks later.

Hydrangea quercifolia. Oakleaf hydrangea. (Zone 5-6). To six feet in the South, where it is native, lower in the North. Broad, suckering shrub. Erect clusters of creamy white flowers in early summer, fading to dark pink. Sometimes outstanding red and orange autumn leaf color, but not consistent. Cultivar 'Snowflake' has pretty, flattened, flowers with numerous sepals.

Hydrangea macrophylla. House hydrangea, hortensia. (Zone 6). To three or four feet in the North, taller in the South. This highly variable species, originally from the Orient, does particularly well in coastal areas. It flowers nicely in the shade, in fact it requires shade in the South. In the North, prune sparingly in spring since you may be removing flower buds. Two distinct kinds come under the name *macrophylla*—mopheads and lacecaps, depending on the appearance of their floral clusters. The following are a few of the many available cultivars: 'Nikko Blue' (mophead), deep blue (reddish on limestone soil); 'Domotoi' (mophead), light blue (pale pink on lime); 'Blue Wave' (lacecap), gentian blue (mauve or pink on lime); 'Mariesii' (lacecap), rich blue (rosy pink on lime). A form of 'Mariesii' with white-variegated leaves is also sometimes available. It has paler blue flowers and is a good foliage plant in the South.

Hydrangea 'Preziosa' (*macrophylla* x *serrata*) (usually sold as 'Pink Beauty'). (Zone 6). Exceptionally clear, bright pink flowers, lightly bronzed leaves. This is a small mophead, more delicate in appearance than typical *H. macrophylla*, and attractive when planted with white-flowered mugwort (*Artemisia lactiflora*).

Hydrangea sargentiana and *H. villosa*, both from China, occasionally adorn mild-climate gardens but are difficult to find in the American trade. The first has velvety foliage, large blue flower clusters with white ray florets; the second has leaves with long soft hairs, impressive lilac-blue clusters with jagged marginal sepals. These hydrangeas have a bold, coarse appearance and are medium-sized to large shrubs. ❀

EVERGREENS ON THE SOUTHERN SCENE

Pamela Harper

Azaleas and camellias are the mainstay of southeastern gardens, but many other flowering evergreens are grown, and as many more aren't but should be. That such vividly red-berried pyracanthas as 'Graber' should be preferred is understandable. A pity, though, that such excellent yellow-berried ones as 'Shawnee' should be thereby eclipsed. It seems that in the South pyracanthas, like tomatoes, must be red to hit the jackpot of wide acclaim. *Stranvaesia davidiana* does have red berries, crimson ones in swinging bunches, not quite such a massed display as pyracantha but, on the other side of the ledger, it doesn't have thorns. The evergreen leaves of this large shrub turn purplish-red on the underside with the advent of cold weather. Variety *undulata* has wavy-edged leaves, and 'Prostrata' is a low, spreading cultivar for the foreground of a shrub border. *Stranvaesia* is, alas, susceptible to fire blight, but so are most pyracanthas.

Durability with Beauty

Many shrubs become commonplace because they are hard to kill. Such a one is Japanese privet (*Ligustrum japonicum*), not fully hardy much north of Baltimore. Otherwise, it is as tough and adaptable as any privet, and handsomer than most, the leaves resembling those of camellias, the flowers showy. Japanese privet grows fast and is much used for hedges, both clipped and informal. *L. j.* 'Rotundifolium' ('Coriaceum'), which has congested and crimped leaves, grows slowly, and is a "character" shrub for formal surroundings.

Two other "toughies" with the same hardiness range are thorny elaeagnus (*E. pungens*) and the hybrid *ebbingei*, much used on highway median strips. These beguile and puzzle the motorist with their far-flung autumnal fragrance from bunches of little rust-speckled flowers

which are much too small to be seen from a passing car. *E. p.* 'Maculata' is the most ornamental cultivar. From a distance it gives the appearance of being in flower because the dark green leaves are broadly splashed down the center with bright yellow, but floral fragrance is foregone.

Equally rugged and with sweet-scented flowers are the *Osmanthus* that flower in fall and winter, *O. heterophyllus*, *O. fragrans* and *O. x fortunei*. The slower-growing, spring-flowering *O. delavayi* is inexplicably neglected. This species with hollylike leaves pleases the eye as much as the nose with a massed display of white flowers in April, and so does the bigeneric hybrid *Osmarea* 'Burkwoodii' with its finely saw-edged leaves. All these will grow in sun or part shade.

Ternstroemia gymnanthera (usually sold as *Cleyera japonica* in the Southeast) is grown less for the small flowers and pretty claw-bracted reddish fruit marbles than for its shapeliness and the light-reflecting sheen of the thick, dark leaves. The oldest leaves turn bright red, and the young ones have the beautiful pink-to-coppery coloring. *Ternstroemia* can become tall in time but grows rather slowly. True *Cleyera japonica*, also an attractive shrub, is seldom grown in the South.

Photinia x fraseri grows tall quite quickly but is usually kept pruned to less than six feet. This, too, is grown primarily for the coppery-red young foliage, as brilliant as that of the best *Pieris* cultivars, longer lasting and frost resistant. Mine, unpruned, has never flowered. One parent of this hybrid, the slightly less hardy *Photinia glabra*, accompanies the bright new growth with upturned saucers of massed white flowers. The flower clusters of the other parent, *Photinia serrulata*, are plate-sized, in keeping with the large dimensions of this handsome shrub which has leaves that are eight inches long. Despite its massive size, this



Photinia serrulata has exceptionally good, bright red berries for autumn and winter display.

shrub is less showy in spring than the other two, but it outshines them when the bright red berries of autumn and winter are on display. All these do well in sun or part shade.

Pay Attention to Site

At seashore level the American *Pieris floribunda* seems to pine for the damp mountain slopes on which it is found in the wild, but under the high shade of loblolly pines *Pieris japonica* and its selections are among the best of flowering evergreens. *Skimmia japonica* is a superb red-berried evergreen if just the right place for it can be found. In my case this means full shade against the north wall of the house, where water cascading from the gutterless roof ensures that the soil never gets dry, but nor does the fast-draining sand get waterlogged. *Skimmia japonica* is dioecious. If grown only for utilitarian purposes then one male provides ample pollen for a dozen or more female (fruiting) plants, but some male clones are handsome enough to earn a place for their red buds and white flowers. Ten-year-old bushes seldom measure much more than eighteen inches high by

three feet wide. The self-fertile, lower-growing *S. reevesiana* appears to be a bit hardier toward the northern limits where these plants can be grown, coastal Connecticut and Long Island.

In a winter when the temperature dropped suddenly from 70° to 10° most of the Japanese pittosporums (*Pittosporum tobira*) grown in coastal Virginia were killed. They have been replanted, and have withstood 5°F when winter came in more gradually. The leaves of *P. t.* 'Variegata' have a creamy white margin, and 'Wheeler's Dwarf' is a neat low mound. Nor are there old specimens of banana-shrub (*Michelia fuscata*) to be seen, but in a not-too-prominent place in the garden winter-damaged foliage can be tolerated for the sake of the appealing banana-scented magnolia-like flowers, one-and-a-half inches across, the petals also banana-colored, with a pencil-line edging of maroon.

Gardenias often suffer winter damage in Zone 8 (Norfolk, Virginia, and south), but it is seldom fatal. The clones sold by nurseries are hardier than those raised for the florists' trade. *Gardenia jasminoides* 'Radicans' grows nearly prostrate, which

makes it easier to protect with a scattering of pine needles if winter turns out to be exceptionally cold. All these do best with shade from afternoon sun.

So does *Fatsia japonica*, which brings a tropical look to the garden, with its great, glossy palmate leaves. In Zone 8 it is usually grown against a wall and, if winter doesn't attend to this, kept pruned fairly low. One then looks down, in October or November, on candelabra of globular white flower heads, striking now and through winter as the ivylike berries form. These are green at first, ripening to bluish-purple in very early spring. *Fatsia x lizei* is sometimes called tree-ivy. I prefer the popular name coined by English gardening apprentices, fatheaded lizzy. This is a hybrid between *Fatsia japonica* and English ivy (*Hedera helix*). The leaves are smaller than those of *fatsia*, with fewer lobes. The habit is less compact and it lends itself well to training against a wall. Alternatively it can be hard pruned to keep it low and bushy. The flowers are similar to those of *fatsia*, but it sets no berries.

Jasmine, *Choisya*, *Raphiolepis*

Of several jasmines that can be grown in southeastern gardens the most underappreciated is *Jasminum humile revolutum*. Not quite hardy enough for New Jersey, but reliable in Zone 8, it is a self-supporting evergreen with canelike stems, green and smooth when young, and pinnate leaves with five dark green leaflets. Of medium height and fairly dense in sun, taller and looser if unpruned in shade, it bears clusters of daffodil yellow flowers at the tips of the branches in June and July.

The Royal Horticultural Society Dictionary (published 1951) states that *Choisya* is a genus of a single species. In the Supplement (1956) it amends this to seven species, with only one brought into cultivation. *Choisya arizonica*, from the mountains of the Southwest, is beginning to get some attention, but the only species commercially available is *Choisya ternata*, or Mexican-orange. Long esteemed in England, and popular in the Pacific Northwest, it reportedly becomes infested with thrips in Southern Califor-

nia. In Virginia it has proved to be reliable and desirable. Mexican-orange will not compete with surface-rooting trees, and in full sun there is some desiccation and leaf loss below 10°F. With a little shade from high pines it remains unmarred. The bright green trifoliate (occasionally five-fingered) leaves are very pungent when crushed, which might seem to be of academic interest, but I have noticed that chewing insects seem to avoid aromatic plants, and so do rabbits. *Choisya* belongs to the Citrus Family, and the clusters of white, starry one-inch-wide flowers in spring in fact resemble orange blossom.

Though summer heatwave and drought may cause even *Abelia* to wilt with thirst, *Raphiolepis* suffers not at all. *R. umbellata (ovata)*, with oval leaves and white flowers, is hardy down to 5°F. *R. indica*, with narrower leaves and pink-flushed flowers, is not quite as hardy. Many, perhaps most, of the "Indian-hawthorns" sold are hybrids of these two species, and a bit variable in hardiness. 'Springtime' is of similar hardiness to *R. umbellata* and I consider it one of the best flowering evergreens for full sun. Of low, mounding habit, an eight-year-old is four feet high and ten across, dense and entirely weed suppressing. In May it is massed with tight-packed clusters of pale pink flowers. *Raphiolepis* roots deeply and stringily and does not transplant well.

Other Evergreens

Not all broad-leaved evergreens are literally broad leaved, nor are all of them green. No shrub better earns its place in my garden than *Rosmarinus* 'Lockwood de Forest', a low, spreading rosemary with branches that are curved and crisscrossing. Baby-blue flowers in quantity open in October, and it will not be without some bloom from then until late April. *Grevillea rosmarinifolia*, the hardiest of the grevilleas, has long, gray-green needlelike leaves and clusters of spidery rosy-red flowers in spring. Jerusalem-sage (*Phlomis fruticosa*) has gray-felted leaves and bright yellow flowers in whorls along the stems. These all want full sun and a well-drained soil, not too rich. So does autumn-sage (*Salvia*

greggii), in fact, no soil seems too poor, hot and dry for it. A low shrub with intensely aromatic leaves, it bears crimson flowers off-and-on through summer, peaking when the weather cools in October. When it gets brittle and woody, hard pruning rejuvenates it. Autumn-sage, which is from Texas and Mexico, is not long lived in gardens here, but a plentiful supply of seedlings come along to take the place of moribund specimens.

Clues to one's likely success or failure with a shrub often lie in its place of origin. New Zealand shrubs (*Hebe*, for example) object to intense summer heat, zero winters, or both. Chile is home to some of the choicest shrubs, also to some of the least adaptable, among them *Desfontainea spinosa*, *Eucryphia*, *Azara* and *Embothium*. West Coast gardeners have a better chance with these than we do in the South. Two exceptionally beautiful Californian shrubs, *Carpenteria* and *Fremontodendron*, are ill-adapted to East Coast conditions. Nor have I succeeded with the beautiful Matilija-poppy (*Romneya coulteri*).

There is solace in such southeastern natives as *Gordonia lasianthus*, the loblolly bay. This, like its close relative the famed *Franklinia*, belongs to the Tea Family, which includes camellias as well. Exquisite large white flower bowls open in late summer. In nature a tree, if kept cut back it resembles in habit a large rhododendron. Given moist soil it does well in sun or part shade.

Purple-anise (*Illicium floridanum*) is a

treasure from Florida and Louisiana, entirely satisfactory in coastal Virginia and worth trying further north. It is of similar appearance to an ironclad rhododendron, but with more streamlined foliage, and liking the same kind of site. The flowers are intriguing ruby red cartwheels two inches across, borne in abundance for several weeks in spring. Regrettably, just at that time it starts to shed its older leaves and these, yellow but still clinging, mar the appearance of the shrub. It is worth taking time to pick them off. On the other hand, *Illicium* has a less pronounced tendency than rhododendrons to shrink from winter cold with curled drooping leaves.

With many shrubs it is summer wet more than winter cold that carries them off in my garden. Such is the case with the sun-roses (*Cistus*) but one, known only as *Cistus hybridus*, which is not a valid name, is an exception. It has pure white flowers in great abundance. Summer wet has also been the problem with their miniature counterparts, the rock-roses (*Helianthemum*) and with the delightful bigeneric hybrid, *Halimocistus sahucii*. It has been a problem, too, with the silvery-leaved, white-flowered *Convolvulus cneorum*, an exquisite shrubby "bindweed" that keeps its place. Placing a large rock over the roots of these small shrubs helps provide dry harbor in times of heavy rain, and surrounding the roots with chicken wire when planting lessens the risk of damage from tunneling moles. ❧

THE CHASTE-TREE

"There is a kind of tree named *Vitex*, not much different from the Willow," wrote Pliny; "the Greeks, some call it *Lygos*, other *Agnos*, i.e. chaste; for that the dames of Athens, during the feasts of the goddess Ceres, which were named *Thesmophoria*, made their pallets and beds with the leaves thereof, to coole the heat of lust, and to keep themselves chaste for the time." All parts of the plant, *V. agnus-castus*, were believed to have "peculiar sedative properties." Turner said that the seed "both fried and not fried, stayeth the desyre to the pleasure of the bodie," and that the flower and the leaf had the same effect, either eaten or drunk, or when "strowed all about wher folke trede."

Alice M. Coats, *Garden Shrubs and Their Histories*,
(E.P. Dutton & Company, New York) ❧



FLOWERING SHRUBS FOR THE UPPER MIDWEST

Edward R. Hasselkus

The Upper Midwest has a number of climatic extremes with which the gardener must contend. Minimum winter temperatures average from -10° to -40°F , and the thermometer in summer may exceed 100°F . Rainfall is about thirty inches a year in the Great Lakes area and less than twenty in the western prairie region. The use of mulches to help retain soil moisture is important, as is the watering of new shrub plantings during the first one to three years in areas where rainfall is low.

Relative humidity in the Great Lakes region is high in summer and low in winter. Summer humidity favors the development of some plant diseases, and most broadleaved evergreens suffer des-

iccation when exposed to the drying winds and sunlight of winter. A planting site with a northern or eastern exposure or the protective shade and shelter of trees may provide a suitable microclimate.

Undisturbed soils of our area are generally fertile and adequately drained. Soil pH is usually alkaline and may be a limiting factor in growing acid-soil shrubs such as azaleas and rhododendrons.

The best of the flowering shrubs suitable for the Upper Midwest offer not only showy, fragrant flowers but landscape interest in other seasons as well. Pleasing form or branching pattern, textural interest, colorful fruits, brilliant autumn foliage and attractive bark are all impor-

tant aesthetic features. Here are some personal favorites:

Cotoneaster multiflorus, Many-flowered Cotoneaster. The many-flowered cotoneaster is outstanding in its genus for a profuse display of white blooms in mid-May. Flowers are similar in appearance to those of pears and hawthorns: In time a plant becomes truly massive in scale. It forms a perfect mound twelve to fourteen feet in height and up to twenty-five feet in spread. Large plants may be pruned into small trees that resemble flowering crabapples. The copious, marble-sized red fruits ripen late in August and remain colorful to October. Birds, especially cedar waxwings, feed on the ripened fruits.

Like other cotoneasters, *C. multiflorus* needs full sunlight and perfect drainage. It is more subject to fire blight than most of its kin, especially if growing in fertile soil and under crowded conditions with limited air movement around the plants.

Forsythia ovata, Early Forsythia. Among the earliest flowering shrubs, the forsythias herald the advent of spring with their yellow flowers produced on leafless branches. Forsythia species and cultivars differ primarily in the size, color intensity and number of their flowers and in their growth habit or form. None bears attractive fruits and autumn foliage coloration is usually lacking.

Although the plants are twig hardy throughout most of our region, flower buds of most forsythias are killed by exposure to temperatures of -15°F . Many times this results in the lack of bloom or the production of flowers only at the base of the plants where flower buds were protected by snow.

F. ovata has the hardiest flower buds of forsythias generally available in the trade, tolerant of temperatures as low as -25°F . Flowers appear in early April, the earliest of the forsythias. They are pale yellow and are both smaller and more sparsely produced than on the less-hardy forsythias. Mature plants attain a height of five feet with a mounded growth habit. Leaves are oval (hence the name of *F. ovata*) to almost round. The corky lenticels of the tan bark give the twigs a pretzel-like appearance.

Regular pruning is essential. The oldest, heaviest canes with darkest colored bark should be selectively removed at ground level just after the flowers have faded. This method is called renewal pruning.

Hydrangea arborescens 'Annabelle', Annabelle Hydrangea. Hydrangeas provide summer blooms which lend a touch of cool white to the hot summer landscape. This cultivar, an improved "hills-of-snow" type, produces large (to one foot in diameter) terminal clusters of white flowers which are effective during late June and July. As the showy sepals age, they turn greenish and finally tan in late autumn. This bold-textured plant is a many-stemmed, mounded shrub attaining a height of about three feet.

Culturally, hydrangeas require moist, though well-drained soil. Application of an organic mulch helps to maintain soil moisture. Cultivar 'Annabelle' is tolerant of shade, so it is often planted on the north side of buildings or beneath deep-rooted trees. Plants exposed to full sunlight may suffer water stress and become wilted when in bloom.

Some dieback of branches occurs in winter, so 'Annabelle' is usually pruned back severely in early spring. Flowers of hydrangeas which are hardy in our area are produced on the new growth later in the same season.

Potentilla fruticosa, Bush Cinquefoil. Most flowering shrubs bear their flowers in a single blooming period during May and June. *P. fruticosa*, its cultivars and related species are unique in that they provide a more-or-less continuous display from June to October. They are valued, too, for their low, dense growth habit and tolerance of a wide range of soil conditions. These small-scale shrubs vary in height from one foot to four feet. The more vigorous cultivars may reach a spread of six to eight feet. Although bush cinquefoils are adaptable to wet, dry, fertile or infertile soils, exposure to full sunlight is essential if they are to perform well.

Leaf texture varies from the yellow-green fine feathery leaflets of *P. parvifolia* 'Buttercup', 'Gold Drop' and 'Klondike' to the bold, rich green foliage

of *P. fruticosa* 'Goldfinger' and 'Jackman's Variety'.

Some of the best cultivars include: 'Abbottswood' (white flowers); 'Goldfinger' (large, deep yellow flowers); 'Longacre' (low, mounded form); 'Primrose Beauty' (pale yellow flowers, blue-gray foliage).

Prunus tomentosa, Manchu Cherry. Manchu cherry is one of the best dual-purpose plants—attractive in the landscape as a flowering shrub and desirable for its luscious edible fruits. It is the hardiest and most drought-tolerant of the shrubby cherries. Like other oriental *Prunus*, its flowers appear before the leaves, in mid- to late April in our area. Pink in bud, the single blossoms are white with a red calyx. The bright red fruits, about one-half-inch in diameter, ripen in July. Because solitary specimens are usually self sterile, several Manchu cherries should be set out in a group to ensure fruiting. Leaves and young twigs are covered with dense hairs, hence the name *P. tomentosa*. Bark of older branches is lustrous, reddish brown and exfoliating.

Ultimate height is five to eight feet, and plants are broader than tall. They are occasionally trained into a treelike form.

Rosa rugosa, Rugosa Rose. Of the shrub roses, *R. rugosa* and its cultivars offer high-quality fragrant flowers and repeat bloom through the growing season. Unlike most modern roses, rugosas do not need spraying, and they require no winter protection.

Long, tapered buds open into flat flowers with five or more petals, mostly in shades of white, pink or magenta. In August, orange-red, quarter-sized fruits (hips) resembling cherry tomatoes begin to appear on many rugosas. Rugosas get their name from the "quilted" or rugose leaves. Foliage may turn yellow or shades of purple, red and orange in autumn.

Plant rugosa roses in well-drained soil in full sun. After established, plants should be renewed pruned each spring before new growth begins.

R. rugosa, the species from which all other rugosas have arisen, has single, bright magenta flowers with yellow stamens. Some of the best cultivars include: 'Alba' (four feet, single white flowers);

'Belle Poitevine' (semi-double rose pink flowers); 'Frau Dagmar Hartopp' (three feet, single pink flowers); 'Magnifica' (double carmine flowers).

Spiraea x bumalda 'Froebelii', Froebel Spirea. Valued for its low mounded form and its summer flowers, the Froebel spirea has long been a popular landscape plant. The erect, slender branches attain a height of about three feet. Foliage is tinged pink-to-red in spring, dull bluish-green in summer and orange-to-maroon in autumn. Its deep pink flowers are borne terminally in flat-topped clusters from mid-June into August. Following the initial flower display in June, lateral shoots develop to produce a second set of flowers above the developing dry brownish fruits.

Because flowers are produced on wood of the current season, pruning should take place in early spring before new growth begins. This shrub is especially useful in parking lot islands or other locations where snow is plowed or shovelled onto shrub plantings. Snow-crushed shrubs cut back to the ground in early spring will produce flowers on the subsequent new growth.

Froebel spirea requires full sunlight and a well-drained soil. It is remarkably free of diseases and insect pests.

Syringa meyeri 'Palibin' (*palibiniana*, *patula*, *velutina*). (See page 15 for description.) Makes an excellent informal hedge plant. Some nurseries grow it on a single stem or "standard" for use as a miniature tree in formal landscapes. One of the best lilacs.

Viburnum carlesii, Korean-spice Viburnum. (See page 69.) This distinguished shrub is of smaller scale than most other viburnums, reaching a height of five to six feet and developing a shapely globular form. The rounded leaves have a velvety dull gray-green appearance. Autumn color varies from orange-red to rich maroon. Fruits are seldom conspicuous.

Like most viburnums, *V. carlesii* tolerates part shade. Although it is rarely troubled by insects or diseases here, rabbits may feed on young plants in winter. Plants are usually sold balled and burlapped. ❀



Vanhoutte spirea and lilac

*Contrary to popular opinion, not all the
best bloom in May . . .*

LEADING CHOICES FOR THE LOWER MIDWEST

John E. Elsley

The continental climate of the Lower Midwest, with its hot, humid summers and extremely cold winters, markedly affects the range of flowering shrubs that can be grown. These conditions especially restrict the use of broad-leaved evergreens. The largest number of shrubs bloom in spring and early summer, and the advent of hot weather often curtails flowers. Watering and mulching are very important in this region, as is pruning to prevent flowering potential being reduced by excessive vegetative growth.

The following shrubs were selected with particular emphasis on ease of culture, a flowering period outside the main spring flush, and ornamental assets in addition to flower. The approximate height and spread of a ten-year-old specimen are indicated.

Aesculus parviflora, Bottlebrush Buckeye. A bushy, upright, suckering shrub with long, erect floral clusters consisting of numerous white flowers with prominent pale pink stamens. Early summer. Valuable both as a lawn specimen and for

massed plantings. Shade tolerant. (8-12' x 8-15')

Caryopteris x clandonensis 'Blue Mist', Blue-spirea. Gray-green foliage and clusters of bright flowers in August. Plants are subject to winter damage, but pruning back to within four inches of the ground in early spring produces a strong, compact shrub by midsummer. An ideal companion for perennials in a sunny situation. (3-4' x 2-3')

Clethra alnifolia, Sweet Pepper Bush or Summersweet. Valued for its terminal spikes of fragrant white flowers, which are enhanced by clean, attractive foliage. A good shrub to attract bees, blooming in July and August. Performs best in moist soil in sun or light shade. *C. a.* 'Paniculata' has larger flower clusters and those of *C. a.* 'Rosea' are pinkish.

Corylus avellana 'Cortorta', Harry Lauder's Walking Stick. This cultivar of the European hazel forms a slow-growing, rounded shrub with curled, twisted branches much in demand by flower arrangers. Pendulous catkins in February. Not grown for nuts. (8' x 8')

Cotinus coggygria, Smokebush. The fruiting panicles, not the flowers themselves, turn this rounded shrub into a gray, pink or greenish-yellow cloud in late June and July. There are several purple-

leaved cultivars, including 'Royal Purple' and 'Velvet Cloak'. Keep well watered until established. (10-12' x 8-10')

Exochorda racemosa, Pearlbush. A Chinese species which, in May, produces racemes of white flowers each 1½ inches across. Excellent choice for a large shrub border. (8' x 8'). The slightly less hardy *E. x macrantha* 'The Bride' is a smaller shrub with larger flowers. The name pearlbush refers to the rounded, glistening white flower buds.

Forsythia x intermedia 'Spectabilis'. The most frequently planted harbinger of spring, easily grown and attaining large shrub size in rather quick order. An ideal subject for late-winter forcing. Other desirable cultivars include 'Karl Sax', 'Lynwood' and 'Spring Glory'.

Fothergilla major, Large Fothergilla. A neat, rounded, eastern North American species too-little used in residential landscapes. Fragrant white, candlelike flower clusters with prominent stamens appear in April and May. One of the finest shrubs for autumn color, the leaves turning orange-yellow and red. Needs acid soil, in the open or light shade. Can grow seven- to eight-feet tall and nearly as wide in time.

Hydrangea paniculata 'Grandiflora', Peegee Hydrangea. Conspicuous, twelve-

Beauty-bush (*Kolkwitzia amabilis*), a dependable shrub for many regions, has pink trumpets of bloom. Its habit is vase-shaped.





False-spirea (Sorbaria sorbifolia) has flower panicles up to eight inches in late June and early July. Spreading by underground stems, it needs plenty of room.

to eighteen-inch-long flower clusters from mid-July onwards. Initially white, they turn pinkish with age, finally brown. At any stage they are excellent candidates for dried arrangements. Pruning in early spring increases the size of the clusters of this common old-timer, which can also be shaped as a small tree. (6-8' x 6-8')

Hydrangea quercifolia, Oakleaf Hydrangea. A native of the American South, desirable as a June-flowering shrub and for its large oaklike leaves which become brightly colored in autumn. Handsome exfoliated bark. Will grow in dry shade. (4' x 4').

Kolkwitzia amabilis, Beauty-bush. An Asiatic shrub related to *Weigela*, for full sun or light afternoon shade. Cascades of pale pink, trumpet-shaped blossoms in mid-May contrast pleasingly with the young, gray-green foliage. Growth habit is vase-shaped. (5-6' x 4-5').

Lonicera fragrantissima, Fragrant Winter Honeysuckle. Although the creamy white flowers are not the most showy, they are very fragrant, opening from February through April when little else is in bloom. Excellent for late-winter

forcing. (6-8' x 5'). *L. standishii* is similar but more compact.

Lagerstroemia indica, Crape-myrtle. Requires a warm, protected site in our area, where it is always killed back to ground level in winter. This results in a multi-stemmed shrub of medium height bright from July through September with large terminal heads of white or pink-to-deep-red flowers. Various cultivars are offered. (4-5' x 4-5').

Poncirus trifoliata, Hardy-orange. Fragrant, two-inch-wide flowers in late April and May contrast markedly with the more-or-less triangular green, spiny stems and shiny leaves. Prominent, heavily scented small oranges (very bitter) are produced September-October. Slightly tender, but with wind protection makes an impenetrable hedge. (8-10' x 6-8').

Rhododendron mucronulatum, Korean Rhododendron. Given a sheltered position this deciduous species produces abundant, delicate, bright rose-purple flowers, a welcome sight during February and March. The compact habit makes this rhododendron suitable for planting adjacent to buildings. (4-6' x 4-6').

Rosa, Shrub Roses. 'Jacques Cartier' is an old-fashioned shrub rose of the 'Portland' type, flowering intermittently though summer. The intensely fragrant, deep pink flowers with greenish centers are produced singly or in small clusters. Good for cutting. (4' x 3'). 'La Reine Victoria' has deep pink, very fragrant flowers which always keep their tight appearance. (6' x 4').

Sorbaria sorbifolia, False-spirea. An erect-to-arching, suckering species from northern Asia bearing large terminal panicles of creamy white in June and July. One of the first shrubs to leaf out in spring, when the lacy compound leaves are especially effective. Ideal for massed plantings. A rapid grower, needing space to roam. (5-10' x 5-10').

Spiraea x vanhouttei, Vanhoutte Spirea. An easily grown shrub with mounded habit, slender arching branches and small bluish-green leaves. Clusters of

white flowers are produced in groups along the branches in May. Excellent for hedges, massing or as a specimen.

Weigela florida 'Variegata'. Creamy-edged leaves and rose-pink flowers in May. One of the prettiest weigelas, and more compact than most. (6-8' x 6-8').

Xanthoceras sorbifolium, Chinese-buckeye. One of our most spectacular flowering shrubs. Large, erect panicles of white flowers, each with a carmine eye, borne in profusion in late April and early May. Pinnate leaves with many leaflets provide an attractive foil for the flowers, which are succeeded by fruits resembling small buckeyes. Despite the somewhat untidy growth habit this tall shrub or small tree deserves to be better known.

Also recommended, and described elsewhere in this Handbook, are *Hamamelis*, *Viburnum carlesii*, *V. plicatum tomentosum* and *Cornus mas*. ❀

Korean rhododendron (*R. mucronulatum*) is a late-winter bloomer in the Lower Midwest, blooming slightly later as one goes north.



Roche



Mock-orange (*Philadelphus* 'Boule D'Argent')

Old reliables and other . . .

FLOWERING SHRUBS FOR THE ROCKY MOUNTAIN REGION

James R. Feucht

The Rocky Mountain region is a highly variable area not only in its extreme changes in elevation, but also in its growing seasons and soil types. To list flowering shrubs that will be adaptable requires first an explanation of the major zones within the region.

The region can be roughly broken into two areas; the Upper Great Plains, ranging in elevation from thirty-five hundred to six thousand feet, and the Mountain Region from six thousand to over fourteen thousand feet. The Great Plains area is generally characterized as having alkaline soils and low precipitation. The mountains may have acid soils and greater amounts of precipitation. The mountainous areas can also vary from dry to wet in short distances and have extremely variable microclimates that limit the growing season to as few frost-free days as twenty-one in an area such as

Fraser, Colorado, with an elevation of eighty-five hundred feet, to seventy-seven days in the highest mountain community, Leadville, at an elevation of over ten thousand feet. (*The apparent discrepancy is due to air drainage, since cold air settles in the valleys—Ed.*)

Flowering shrubs that can be recommended for any place in the Rocky Mountain region are few but the following have been found reliable, even at ten thousand feet: Tatarian honeysuckle, Siberian peashrub, bush cinquefoil, wax currant, European cranberry bush, common and Persian lilac.

Tatarian honeysuckle (*Lonicera tatarica*) has showy, cream flowers early in the season, followed by pairs of glossy, scarlet fruit. Its bluish-green foliage also makes it an attractive shrub during the summer months. In the Rocky Mountain region it rarely attains a height of more

than nine feet. A cultivar, 'Arnold Red', has more showy, bright rose-red flowers. Honeysuckle seems to do well in almost any soil and will tolerate some shade.

The Siberian peashrub (*Caragana arborescens*) has been widely used as a windbreak in the Upper Great Plains and endures a considerable amount of drought. During late spring and most of summer it produces quantities of yellow, sweetpealike flowers. These are followed by small pods that remain on the plant after opening, developing interesting curled or twisted shapes. The foliage is finely textured, giving it a ferny appearance. In the winter months its greenish stems provide an interesting contrast in the landscape. At low elevations the shrub may attain a height of eighteen feet or more and occasionally is trained as a small tree.

Bush cinquefoil (*Potentilla fruticosa*) is a native of the Rocky Mountain region, found growing even at timberline at elevations of over eleven-and-a-half thousand feet. This shrub is versatile in that it will grow in almost any soil, but it does best in a well-drained, sunny site. Flowers of the cinquefoil can be showy because of their numbers. Many cultivated varieties are available, such as pure white 'Mount Everest', light, lemon yellow 'Katherine Dykes', deep yellow 'Jackman's Variety', and pale orange 'Tangerine'. Height varies from two to four feet.

The European cranberry-bush (*Viburnum opulus*) is an old-timer, introduced into the Rocky Mountain region back in

the gold mining days. It is not the fertile flowers in the center that are the showy part of the inflorescences, but the sterile white ray florets. The fertile flowers develop into brilliant, red berries later in summer. Berries often remain on the plant into winter and provide valuable food for wildlife. European cranberry-bush will tolerate some shade and prefers a cool, somewhat moist soil. It is capable of attaining a height of about twelve feet but smaller forms are also available.

Some of the more reliable shrubs, particularly in well-drained, sunny sites, are the currants and gooseberries. A native of the Rocky Mountain region, the wax currant (*Ribes cereum*) can be considered a multi-purpose shrub. It is grown for its whitish flowers tinged pink in the spring, glossy foliage, edible red fruit in late summer, and brilliant fall color. The wax currant adapts to a wide variety of soils and endures long periods of drought. Below eight thousand feet, the golden currant (*R. aureum*) is even more showy with relatively large, yellow, trumpet-shaped flowers. The flowers are followed by edible red fruit, but the foliage lacks the brilliant fall color of the wax currant. It is a good shrub for hot, dry locations.

Common lilac (*Syringa vulgaris*) is one of the most versatile shrubs for the Rocky Mountain region and, like European cranberry-bush, was introduced by early pioneers, even in the mountain mining towns. Vagaries of climate don't permit a consistent bloom time. In areas of very short growing seasons, particularly above



Oregon grape-holly (*Mahonia aquifolium*) is a glossy-leaved evergreen whose yellow flower clusters give way to dusty blue berries in grapelike clusters.

eight thousand feet, flowers may not appear until late June or early July, instead of early May at lower elevations.

The lower-growing Persian lilac (*S. persica*) will also thrive in nearly every location in the Rocky Mountain region, up to ten thousand feet. One advantage to growing this shrub in areas with short growing seasons is that it rarely, if ever, develops the brownish pods, thus requiring no pruning whatsoever after bloom, only an occasional thinning. Above six thousand feet, lilac does not seem to be plagued by oystershell scale or borers, both common at lower elevations.

Flowering shrubs reliable in the High Plains region, six thousand feet or less, include the wayfaring-tree, Korean-spice viburnum, common mock-orange, showy border forsythia, Japanese flowering quince and Oregon grape-holly.

Wayfaring-tree (*Viburnum lantana*) is one of the viburnums most adaptable to alkaline soils. This tall shrub produces showy clusters of white, starlike flowers against a background of interesting, leathery-looking, slightly gray-green foliage. The fruit changes from green to orange-red, and eventually to black, often drying up on the shrub and appearing much like raisins. Fall color is bronze-purple. Wayfaring-tree can attain a height of fifteen feet and occasionally is trained into a small tree. For areas where space is limited, the Korean-spice viburnum (*V. carlesii*) is useful. This compact shrub, attaining a height of no more than five feet, develops spicy fragrant flower clusters in early spring. The flower buds are a deep rose-pink before opening, changing to a lighter pink as the florets open, then finally to white. The foliage is much like the wayfaring-tree but usually smaller and more glossy. Fruits are a shiny, red-to-wine-red. Korean-spice viburnum is not as drought-enduring as the wayfaring-tree and prefers a fairly rich soil.

Common mock-orange (*Philadelphus coronarius*) is another old-fashioned shrub. For durability and showy, fragrant white flowers, it is hard to beat. Hybrids of this species have produced the Lemoine group including 'Avalanche', known for its graceful arching branches, and 'Mont Blanc', which is quite showy.

One criticism of this shrub is that it tends to develop a leggy habit, but this is usually because it is planted too close to buildings and other structures and is pruned severely to compensate. Giving it more room will allow the shrub to develop its full potential. Mock-orange tolerates light shade here and seems to adapt to almost any soil condition except extremely dry soils.

The showy border forsythia (*Forsythia x intermedia*) is a hybrid from which several good selections have been made, including 'Karl Sax', 'Lynwood' and 'Spring Glory'. The large flowers of 'Karl Sax' are the result of doubling of chromosomes (tetraploidy) induced by using colchicine, a growth regulator from the autumn-crocus (*Colchicum*). 'Spring Glory' is a sport from 'Primulina'. While the flower buds on a forsythia are not dependably hardy in some of our colder areas and the flowers are occasionally damaged in spring freezes, this shrub is still worthwhile grown as a harbinger of spring. The cut branches can also be brought indoors late in winter for forcing and are favored by those who specialize in flower arranging. Forsythia seems to adapt to a wide variety of soils, preferring fairly moist sites. In the Rocky Mountain region it is best to avoid planting it in the exposed west or northwest locations.

Among the most showy of spring-blooming shrubs are the various flowering quinces (*Chaenomeles*), especially *C. japonica*. These compact shrubs will take a dry site in full sun in stride. The large, showy blossoms appear before the foliage and may vary in color from rose-red to red-orange and salmon color, as well as variegated petals containing streaks of white.

Oregon grape-holly (*Mahonia aquifolium*) is a useful broad-leaved evergreen in shady locations. It is hardy to eight thousand feet if given protection from wind and bright winter sun. The showy yellow flowers, glossy, hollylike foliage and bluish grapelike fruits make it attractive year-around. The creeping mahonia (*M. repens*) is a native ground cover for shade or part sun. Unprotected foliage will turn a showy, bronze color in winter. ❀



Camellia japonica 'Mathotiana'

*Generally favorable growing conditions
encourage a wealth of . . .*

FLOWERING SHRUBS FOR COASTAL BRITISH COLUMBIA, WASHINGTON AND OREGON

J. A. Witt

The land situated between the Cascade Mountains on the east and the Pacific Ocean on the west, extending from Southern British Columbia south through Washington and Oregon has climatic conditions very similar to those found in the British Isles. This narrow region's weather is tempered by marine air from the Pacific, and neither summer nor winter temperatures are extreme. Minimum temperatures rarely go below -5°F while summer seldom sees maximums over 100° . Rainfall varies from

fifteen inches or less in the immediate rain shadow of the Olympic Mountains to over one-hundred-fifty inches on the coast. The precipitation pattern is of a Mediterranean type, with most of the rain falling in the winter while the summers may be very dry, making irrigation a must for plants which come from a wet summer climate. Despite the generally equitable temperatures, an occasional Arctic front will plague the area with temperatures well below average, killing many long cherished plants in local gardens.

As might be expected, broad-leaved evergreens grow well and are the basic garden shrubs in the Pacific Northwest. It is the rare home in Seattle, Portland or Vancouver which does not have at least one rhododendron or camellia, no matter how neglected the garden may be.

Below is a list of shrubs which have proven successful in the area and which are usually available in the nursery trade. Some will require a bit of searching to locate, but are worth the extra effort.

Strawberry-tree (*Arbutus unedo*), a relative of the native madrona (*A. menziesii*), is a five- to ten-foot-tall evergreen with clusters of small white bells in October and brilliant red marble-sized fruits in November. Two cultivars of merit are *A. u.* 'Compacta', a smaller, tighter shrub, and 'Rubra', with pale red flowers. All need good drainage, nearly full sun and some protection from cold north winds.

The multitude of manzanitas (*Arctostaphylos*), which grow so well in California are reduced to a handful of species in the cool, moist Coastal Northwest. Hairy manzanita, (*A. columbiana*), and Stanford manzanita (*A. stanfordiana*) are pink-flowered species. The tall-growing *A. manzanita* may reach fifteen feet and opens its clusters of white bells in February or March. All manzanitas require full sun and sharp drainage to do well. They should not be watered in summer.

The evergreen *Berberis* and *Mahonia* (the northwestern botanist usually groups them under *Berberis*) are indispensable. Darwin barberry (*Berberis darwinii*) from Chile, a spreading shrub with bright green hollylike leaves, is covered with golden orange flowers in early spring. It is followed by the native Oregon-grape (*Mahonia aquifolium*) and *M. nervosa*. The former grows four to eight feet with clusters of yellow flowers and spiny compound leaves. Dwarf forms are available. *M. nervosa* is a much lower-growing shrub, really a ground cover, which does best in dry shade.

While one associates camellias with the Deep South, they grow very well in the Coastal Northwest. *Camellia japonica* selections are unquestionably the most popular because of their shiny green foliage and large showy flowers from late

March through mid-May. The more refined autumn- and winter-flowering sasanquas are nearly as popular despite the tendency of their delicate flowers to be damaged by heavy fall rains. The discriminating gardener has found *Camellia saluenensis* cultivars and its hybrid with *C. japonica*, the *C. x williamsii* group, to be most satisfactory plants, tough, tidy and floriferous, with single or semi-double pink flowers which drop upon fading. 'Rose Bowl', 'Donation' and 'Mary Christian' are old reliables.

Elegant and refined redvein enkianthus (*E. campanulatus*) has whorls of shiny green leaves which turn brilliant orange or red before dropping in autumn. The pendulous racemes of bell-shaped rust and creamy green flowers attract the gardener's attention in late April or early May. At home in partial shade, enkianthus blends well with rhododendrons and camellias and is very satisfactory in the woodland garden.

Winter-flowering plants are especially welcome in this region of cloudy winter days. Among the most attractive is silk tassel (*Garrya elliptica*), whose six- to eight-inch-long gray-green catkins often expand in late December and may last through February. Crinkly-edged leaves of dark green persist throughout the year. 'James Roof', a selected male form, may have catkins twelve inches long. It is a useful plant for a warm wall.

Brooms, Witch-hazels and Others

Brooms are among the most common shrubs in our area, and Scotch broom (*Cytisus scoparius*) is a ubiquitous escape. Lydian broom, (*Genista lydia*), however, is well mannered, ideal as a ground cover on sunny, well-drained sites. Seldom over two feet tall, it is covered by bright yellow pea flowers in May.

Chinese witch-hazel (*Hamamelis mollis*) rarely fails to brighten the New Year, its golden yellow flowers in clusters of four or five. The large heart-shaped leaves cover the shrub during the spring and summer, then turn vibrant yellow in the fall before dropping. It can become an open shrub of ten to fifteen feet in height and grows well in full sun or partial shade.

Hydrangeas are among the most useful



Warminster broom (*Cytisus x praecox*), the first broom to blossom in spring, has pealike, pale yellow flowers on bright green stems. A good coastal shrub.

shrubs for late summer flowering, and the large mopheaded macrophyllas are the most popular. The acid soils of the area bring about predominantly blue flowering heads, although the pinks can be maintained by liming the soil regularly.

Another good companion for rhododendrons is mountain-laurel (*Kalmia latifolia*). This native of eastern North America tends to be slow to flower but is reliable once it starts. The bright rose-to-white clusters of flowers and dark green leaves blend well into the predominantly evergreen background. Several cultivars are gaining popularity including those with banded or zoned flowers while 'Ostbo Red', a local selection, remains choice.

Another genus of ericaceous plants that has proven to be highly successful in the coastal northwest is *Pieris*, misleadingly called "andromeda," which is the botanical name reserved for a certain group of bog plants. *Pieris japonica* with its cascading clusters of white or pink bells from February through early May is most popular, and numerous selections are available. The more flamboyant *P. formosa* var. *forrestii* is, not entirely hardy but *P. 'Forest Flame'*, presumed a hybrid of *P. forrestii* and *P. japonica*, is a reliable substitute. Its new foliage, tinted the brightest red, and its long panicles of white flowers make it outstanding.

Rhododendrons, including azaleas, are the premier shrubs for Coastal Northwest gardens and grow well under a wide variety of conditions. Most gardeners start

with the large and showy hybrids first developed in England but now being actively produced by West Coast breeders. However, once bitten by the rhododendron bug many gardeners find the species or wild forms more challenging and satisfying. Perhaps as many as four hundred species and cultivars are available in the trade. Azaleas are not as common here, and, indeed, the evergreen sorts are not quite as satisfactory as they are in the Middle Atlantic States and the Southeast. The deciduous azaleas, however, do wonderfully well, as the popularity of the brilliantly flowered and often fragrant Knap Hill and Exbury types attest.

A prophet without honor is the red flowering currant (*Ribes sanguineum*). One of the most lovely of West Coast natives with its pendulous racemes of pink to bright carmine red and spice-fragrant flowers, this currant is more appreciated in England than in its homeland.

Viburnums, both evergreen and deciduous, are useful shrubs for the area and include everything from ground covers such as *V. davidii*, to small trees such as *V. rhytidophyllum*. The early-flowering deciduous *Viburnum x bodnantense* 'Dawn' is a shrub with a somewhat awkward habit, but it pays its keep by producing clusters of bright pink flowers during the gray winter months. While the flowers are apt to be damaged by sharp frosts, it is the rare winter when one cannot cut a spray or two in December and January. ❀

*The proper selection of shrubs
gives year round bloom . . .*

FOR THE PACIFIC COAST SOUTH

Philip E. Chandler

The flowering shrubs that are most successful in the heavily populated parts of Southern California are those requiring little or no seasonal rest. The relatively light winter chilling in our area, particularly in coastal zones, is inadequate for a great many ornamentals from the cool-temperate zones. Dormancy from drought may last six months or more, but most urban and suburban gardens are watered copiously the year around. Alkaline water and slow-draining clay soils, where winter moisture lingers, further limit the well-being of numerous handsome shrubs that insist upon special aeration. Some tropical ones find the nights too cool even in summer.

Despite these limitations the palette is extensive. Among the shrubs that flower conspicuously the following, all evergreen, are characteristic of the heavily irrigated dry subtropical climate that is generally milder than most parts of the Mediterranean.

Pittosporum tobira, more notable for its architectural quality and adaptability than for bloom, displays clustered cream-white fragrant flowers, which are often overlooked amid the color carnival of a California March. This plant makes a dark green, glossy mound of variable height, and it seems entirely at home in sun or shade in all soils, wet or dry, throughout several climate zones. *Pittosporum* is in fact the most versatile introduced shrub here.

Raphiolepis (now spelled *Raphiolepis* by some botanists) is an attractive mild-climate group of plants related to cotoneaster and hawthorn. *R. indica*, the India-hawthorn, is the most floriferous shrub in the California winter. It is tolerant of sun or considerable shade, most soils and microclimates. India-hawthorn grows three to six feet high and across and has deep matte green foliage with copper-tipped new growth. This and re-

lated forms have an abundance of pink or white flowers from December to April, with the peak in early March. Less vigor is shown far inland.

Of the limitless azalea cultivars some are in flower in Southern California every month, possibly excepting July. They are shade-loving, grow two- to six-feet tall, insist on fast drainage, and are often short lived. Even so, azaleas are among the most widely planted ornamentals. Colors are white through pastels to smashing hues and chromas. Deciduous azaleas are seldom successful.

Autumn and Winter Bloomers

Camellia japonica cultivars in pink, white and crimson, of many shapes and sizes, adorn lightly shaded areas from November into April. They are dark and glossy of foliage, usually rigidly upright in form, eventually treelike. They are poor performers in clay. Sasanquas are more versatile in form and habit. Some are softly vining or pendent, others grow upright or spread to form wall shrubs, hedges or ground covers. Flowers are smaller, less stiff, occur mainly in fall and early winter.

Mahonia lomariifolia is especially appropriate from Christmas through Twelfth Night in filtered shade. At this time the flowers appear, in whorls resembling golden candles. These are borne on tall canelike stems from which radiate long pinnate leaves (as many as nineteen pairs of spired leaflets). The flowers are succeeded by steel-blue, grapelike fruits.

There are two other large shrubs identified with winter here. One is *Leptospermum scoparium*, New Zealand-tea, which has various cultivars. The crimson, pink or white flower clusters almost obscure the very narrow leaves. The other shrub is *Calliandra haematocephala* (*inequilatera*), sometimes called red powderpuff. Its flowers of penetrating hot red-pink



Raphiolepis 'Clara' showing the attractive upright leaves. It blooms abundantly during the California winter.

emblazon the bright green pinnate foliage from autumn to midspring provided that the shrub, which can grow to eight feet or more, is not sheared for control. Powder-puff, which is from Bolivia, makes an eye-catching espalier as well as a dense screen in a relatively frost-free position.

Cotoneaster lacteus (*parneyi*) and all the pyracanthas have conspicuous white flowers in early spring, though both genera are planted primarily for their colorful fruit in fall or winter.

For Summer Bloom

The following seven common shrubs flower predominantly in summer and fall. Glossy abelia (*A. x grandiflora*), six- to ten-feet high and across, is widely adaptable. It has a bronze-green appearance and bears thousands of small pinkish-white flowers in calyces that become coppery and persist into early winter. *Carissa macrocarpa* (*grandiflora*), the Natal-plum, a spiny-branched evergreen varying in stature from prostrate to fifteen feet, produces fragrant white flowers which are waxen and star-shaped. They are two inches across. The blossoms are succeeded by dark red, edible, plum-shaped fruits. This elegant ornamental from South Africa is somewhat tender.

Hibiscus rosa-sinensis hybrids, often treelike, are grown for their brilliant flowers to six inches across of every hue but blue and violet. Growth habit is coarse and foliage quality often dubious, especially in winter.

Oleander (*Nerium oleander*) is now

available in dwarfs to four feet and intermediate heights as well as the common giants in white, pink, salmon, pale yellow, red and rose. From July through October at the coast, much longer inland, these tough, heat-loving shrubs, tolerant of over-watering or almost no water, light the land with flowers. The wood and foliage are exotic.

Solanum rantonettii, the blue potato-bush, forms a ten-foot mound covered with small blue-violet flowers for six months or more. It becomes pale and thin-leaved with wind and chill, and is best cut back in winter or whenever ungainly. A semi-climber, this South American plant also spills, producing a quick effect.

Tecomaria capensis 'Golden' is a recently introduced cultivar of the species, which can become a behemoth. The yellow-orange flowers of this selection are stunning, and the plant is controllable at six feet.

Tibouchina urvilleana, a soft-textured shrub with velvety leaves that age orange, is known as the princess flower. Clustered three-inch flowers of royal purple, especially abundant in fall, create a memorable image. Most successful in a moist location away from strong wind, *Tibouchina* may be grown as a small open tree or pruned hard after each wave of flowers, with plant size kept to about four feet high and across.

A few shrubs, quietly elegant, flower throughout the year. One I am fond of is *Grewia occidentalis* (*caffra* of the trade). It is usually espaliered or grown as a ten-foot screen. Lavender flowers, which are starlike, illuminate the mass of medium green foliage. *Grewia* can be grown in full sun or some shade. Another continual performer, *Escallonia x exoniensis* 'Frades', makes a six-foot dome of polished dark green leaves. It is embellished by terminal panicles of pink-to-rose flowers. The shrub is best given full sun or very light shade. ❧

*Sophora secundiflora*

A wide area, with many . . .

FLOWERING SHRUB CHOICES FOR THE DESERT SOUTHWEST

Warren Jones

Narrowing down a list of the "best" flowering shrubs for the Desert Southwest and keeping it to a reasonable length in deference to space constraints becomes something of a problem. There is an abundance of nominees both native and introduced.

The region ranges from below sea level at El Centro, California, to around forty-five hundred feet at the northern and eastern fringes. This means a climatic variation from an almost tropical low desert to high desert experiencing some very snappy cold spells every winter. The middle desert at around twenty-five hundred feet above the sea is a blend of the two, with some characteristics of each. The fact that most plantings are irrigated at least part of the time adds another variable and further extends the

possible list of beauties that could be included. Defining the water requirements and drought tolerances becomes a major consideration in selecting and grouping.

All three desert zones have certain things in common. They get very hot and they are very dry with little precipitation. The intensity and length of the hot season decreases with a rise in elevation while the annual rainfall increases. The almost-constant sunshine is a factor that all three levels have in common. Water is generally of poor quality and in many areas is costly and in short supply. The soil in these desert valleys is generally quite fertile, though there are regions where it is very shallow and underlaid with "caliche," a cemented layer that is impossible for roots or water to penetrate. Breaking through this caliche and

creating plants pockets of good soil is a landscape must and a real expense. All these factors affect all landscape programs and must be dealt with if success is to be achieved. In spite of the outlined difficulties there is no shortage of good flowering shrubs.

To begin with, it should be said that many flowering shrubs growing in the desert can be either a large shrub or a small tree depending on the water supplied them and how they are trained. *Acacia farnesiana* and *Acacia smallii* would certainly fall in this category. Both are referred to as Sweet Acacia and it takes a botanist to tell them apart. The important difference is that *Acacia farnesiana* is not hardy except in the low desert zones while *Acacia smallii* can be grown in all three zones. Growers are urged to certify their seed sources. Both of these species produce an abundance of fragrant orange-yellow puffball blossoms set in feathery evergreen foliage. The shrub is quite thorny so it can be used as a barrier plant and, if given additional water and training, it can be developed into a really fine patio-size tree. Both grow in almost any soil with good drainage.

Caesalpinia (Poinciana) gilliesii, bird-of-paradise bush, is a true desert-flowering shrub succeeding under very dry conditions, but preferring regular irrigation. Its large showy yellow flowers with bright red stamens are borne in clusters on branch tips all through the warm part of the year. The upright but spreading, open structure can reach more than six feet in height. Its feathery, somewhat sparse, foliage is deciduous in winter and can go drought-deciduous at other times. It produces a rather large crop of unique beans that pop with a bang when ripe, shooting seeds in all directions. A very good plant for naturalizing in waste areas, hardy in all zones, it will grow in just about any soil. This is one of the most undemanding of the flowering shrubs.

Caesalpinia (Poinciana) pulcherrima, the dwarf poinciana, produces bright red-to-orange blossoms all summer. It is more tender and generally does not reach the same height as its hardier relative. It can be grown in all three zones but is generally cut to the ground by frost in the mid-

dle and upper desert valleys, but is improved by a heavy pruning even in a frost-free location. The dwarf poinciana is not particular as to soil but does require a regular irrigation program to bloom well. It does not naturalize freely as bird-of-paradise bush does. Both require full sun and revel in hot locations.

From the genus *Cassia* come many of our best flowering shrubs. One that is particularly good here is *Cassia artemisioides*, the feathery cassia of Australia. It develops into a beautiful gray-green mound of four-to-five feet, covered in late winter with little yellow pea-shaped blossoms. A true desert plant, it thrives under quite dry situations, though regular irrigation will improve its appearance. Best planted in full sun and a protected location since a sharp frost can interrupt its winter bloom. An undistinguished crop of green pods follows flowering, but these can be sheared off to stimulate new growth. It grows well in a variety of desert soils, but requires good drainage.

Another Australian, *Cassia nemophila* is similar to the feathery cassia. Though it doesn't have the silvery foliage, it is somewhat grey-green. However, it is just as spectacular a winter bloomer and also is hardy in all three zones. Soil tolerance and water requirement are the same for both species.

Callistemon citrinus, the lemon bottlebrush, is one of the more spectacular flowering shrubs for desert gardeners. Its bright red blossoms, actually a bottlebrushlike arrangement of stamens, produces a brilliant floral display in spring, with scattered flowering on and off through the rest of the year. A fairly upright shrub covered with lance-shaped bright green leaves, it generally grows to eight feet, but can be trimmed up into a small tree. It also makes a good hedge and can be espaliered, but it is generally used for a colorful informal shrub. It grows well in full sun or part shade and is generally hardy in the low and middle zones, though it can be damaged in a very severe winter. It grows well in average soil, but must have good drainage. Bottlebrush needs regular, but well-spaced irrigation. Overwatering will result in chlorosis, one of its major problems.

An American desert native, Texas silverleaf (*Leucophyllum frutescens*) is a dependable performer if given good drainage.

Hibiscus rosa-sinensis, the Chinese hibiscus, one of those universally admired flowering shrubs, and is found in almost all warm climate gardens. The desert is no exception. It becomes a four- to ten-foot evergreen shrub depending on the cultivar. It has dark green leaves and is continuously in bloom during the warm part of the year. The flower form varies from a flaring single trumpet with a waxy texture to very full doubles, sometimes six inches across. The color assortment ranges from pure white to yellow, orange, pink and deep red. Blossoms last just a day, but there is generally a new crop opening each morning. The single types are the most satisfactory for desert regions. Chinese hibiscus prefers full sun and needs a protected location because it stands little frost. It is best in the low desert valleys but performs well in protected locations in the intermediate valley. It is best planted in enriched well-prepared soil. It needs regular irrigation and should never be allowed to really dry out. Little pruning is required except when it has been damaged by frost.

Jasminum mesnyi, the primrose jasmine, can be trained as a vine, but is more often used as a large mounding shrub. Occasionally reaching six feet, but generally pruned back annually to keep it in a lower mass. It is especially good for banks and tumbling over walls. In late winter and early spring it is covered with masses of double bright yellow blooms. Primrose jasmine, hardy in all three zones, needs a well-prepared garden soil with regular irrigation. It blossoms and performs well in full sun to open shade.

Leucophyllum frutescens, the Texas silverleaf, is one of the best all-around shrubs for desert regions. It develops into a shrubby mound of about six feet covered with beautiful pearl gray leaves. The color of the foliage alone is reason enough to plant it, but at varied intervals during the summer it explodes into masses of lavender- to orchid-pink blooms. These small tubular flowers stay on the shrub for sev-



Jeff Johnson

eral days before dropping to the ground but still retaining their color for several days, continuing the colorful effect. A true desert plant, it thrives in exposed, hot locations and can get along with very little water. For best landscape effect it should have deep, widely spaced irrigation. It is hardy in all three zones, taking any soil but requiring good drainage.

The universally planted *Nerium oleander* probably achieves its greatest flowering perfection in the southwest. In desert communities its floral exuberance is almost overwhelming when it first bursts into bloom and continues off and on throughout the rest of the warm part of the year. The oleander would certainly rate as an outstanding desert landscape shrub even if it never flowered. It is most serviceable as a large evergreen background shrub, clipped hedge or even a small tree. It ranges in size from the four-foot 'Petite Pink' to the larger varieties such as 'Sister Agnes' growing to twenty feet. The fragrant flowers are borne in both single and double clusters, ranging in colors from white through pale yellow, soft pink to very deep red. The deep green lance-shaped leaves are especially handsome. The shrub's dense character makes it an especially fine background plant. It can be sheared into a good-looking formal hedge but this is at

the expense of flowering. The oleander grows in any soil and is very tolerant of poor quality water. It survives considerable drought but needs regular irrigation for good appearance. It takes almost any exposure but prefers full sun. Oleanders are commonly planted in all three zones. The growth is sometimes checked in cold locations during the winter, but recovery is so quick in the spring, one tends to forget it. All parts are poisonous.

Punica granatum, the pomegranate, was one of the first plants from the Old World to be planted in the Desert Southwest. This large deciduous shrub, prized for its bright red fruit, also makes a colorful splash with its ruffled Chinese red blossoms borne in late spring and early summer. Pomegranates are hardy, grow well in almost any soil and need widely-spaced deep irrigation to perform well. The bright yellow autumn color compensates for its bareness in winter.

Raphiolepis indica, India-hawthorn, is a popular evergreen shrub in the Southwest. It creates a dense mound covered with dark green leathery leaves three to four inches long. The dwarf and compact cultivars are especially suitable for low foundation planting. The full clusters of small single flowers appear in midspring, with a range of white, soft pink, lavender and deep rose. This may be followed by blue-black berry clusters among the dark green leaves, which may not be much of a color note but is interesting at close range. India-hawthorn is hardy in all zones, taking full sun in higher elevations but happier in part or deep shade in lower areas. It needs a fairly rich well-drained garden soil with good drainage and regular irrigation but may become chlorotic if overwatered. *Raphiolepis* is not a plant for alkaline soils.

Sophora secundiflora, the mescal bean, has many outstanding qualities for desert landscaping. Though a bit slow at first it becomes a dense bright green shrub eventually reaching eight to ten feet. With a little extra training and care it can be developed into a handsome small patio-sized tree. The glossy compound leaves are an especially bright, rich green that makes a perfect foil for the lavender-to-purple wisteria like flowers with violetlike

fragrance in March and early April. The lush appearance of foliage and flower is surprising for such a tough desert plant. This Texas native is very drought tolerant but, like most desert plants, grows better with supplemental irrigation. Hardy in all three desert zones, it takes full sun or part shade and is not at all fussy about soil. Pods, looking a bit like peanuts in the shell, follow the bloom period. These contain showy bright orange beans.

Tecoma stans, the yellow trumpet bush, is widely distributed about the warm deserts of North America. It is a very showy flowering shrub that can be depended upon to produce large spikes of trumpet-shaped flowers over the warm season. It needs to be supplied with an occasional deep irrigation for, like most true desert plants, it goes into a dormancy when dry, but bursts back into exuberant growth when moisture returns. The tooth-edge compound leaves, a bright glossy green, are evergreen unless the plant is subjected to prolonged drought or a sharp frost. *Tecoma* becomes a six- to ten-foot shrub, even a small tree in mild regions, but freezes back to the ground in cold locations. It comes back quickly from below ground when severely frosted and old well-established plants may regrow to six feet in one season. A hard pruning in early spring seems to improve the shrub's appearance and an occasional removal of the long pods will keep it blooming and improve its general appearance in summer.

Vitex agnus-castus, the chaste tree, is especially well-adapted to the Southwest. It has great drought resistance and will even survive without irrigation if placed where a little run-off can accumulate. The blue-to-lavender blossoms of early summer are a welcome color note in a hot landscape. Not particular about soil, it prefers a sunny exposed location and is hardy in all three zones.

Other recommended shrubs include *Bauhinia variegata* (orchid tree), the bougainvillas, *Erythrina bidwillii* (Bidwell coral tree), lantanas, especially the *Lantana camara* cultivars, *Plumbago auriculata* (Cape primrose), *Tecomaria capensis* (Cape honeysuckle), and *Thevetia peruviana* (yellow "oleander"). ❀

SUGGESTIONS FOR FURTHER READING

A lady with whom I tried to open conversation at a tea-party by mentioning some recent novel, said enthusiastically, "Oh! books are so interesting, are they not?" I knew not what to say, and replied feebly that I thought some books were more interesting than others.

Sir Arthur Hort, *Garden Variety*

The following are the editors' recommendations plus some made by regional contributors.

- Brooklyn Botanic Garden. *Nursery Source Guide*. Handbook No. 83, Brooklyn, New York. See back cover of this Handbook for other appropriate titles.
- Gordon Courtwright. *Trees and Shrubs for Western Gardens*. Timber Press, Forest Grove, Oregon.
- Michael A. Dirr. *Manual of Woody Landscape Plants*. Stipes Publishing Co., Champaign, Illinois.
- Joseph V. Enzie. *Ornamental Shrubs for New Mexico*. Circular 448, Cooperative Extension Service, New Mexico State University, Las Cruces.
- S. Millar Gault. *The Color Dictionary of Shrubs*. Crown Publishers, New York.
- John A. Grant and Carol L. Grant. *Trees and Shrubs for Pacific Northwest Gardens*. Pacific Books, Palo Alto, California.
- R. Gordon Halfacre and Anne R. Shaw. *Carolina Landscape Plants*. Sparks Press, Raleigh, North Carolina.
- Roy Hay and Patrick M. Syngé. *The Color Dictionary of Flowers and Plants for Home and Garden*. Crown Publishers, New York.
- Hilliers' *Manual of Trees and Shrubs*. Hillier and Sons, Winchester, England. Concise descriptions of eight thousand trees and shrubs.
- Mildred E. Mathias, Editor. *Color for the Landscape, Flowering Plants for Subtropical Climates*. California Arboretum Foundation, Arcadia, California.
- Peter Seabrook. *Shrubs*. Floraprint Ltd., Calverton, Nottingham, England.
- Sunset Books, Editors. *Sunset New Western Garden Book*. Lane Publishing Co., Menlo Park, California.
- Donald Wyman. *Shrubs and Vines for American Gardens*. Macmillan, New York.
- . *Wyman's Gardening Encyclopedia*. Macmillan, New York.
- Out of print but also recommended: Alice M. Coats, *Garden Shrubs and Their Histories*; P.J. Van Melle, *Shrubs and Trees for the Small Place*; Graham Stuart Thomas, *Colour in the Winter Garden*; Isabel Zucker, *Flowering Shrubs*.
- Special Library Reference: W.J. Bean, *Trees and Shrubs Hardy in the British Isles*, revised edition, four volumes. As thorough a reference as is likely to be seen in some time. ❧

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.....cut off here.....

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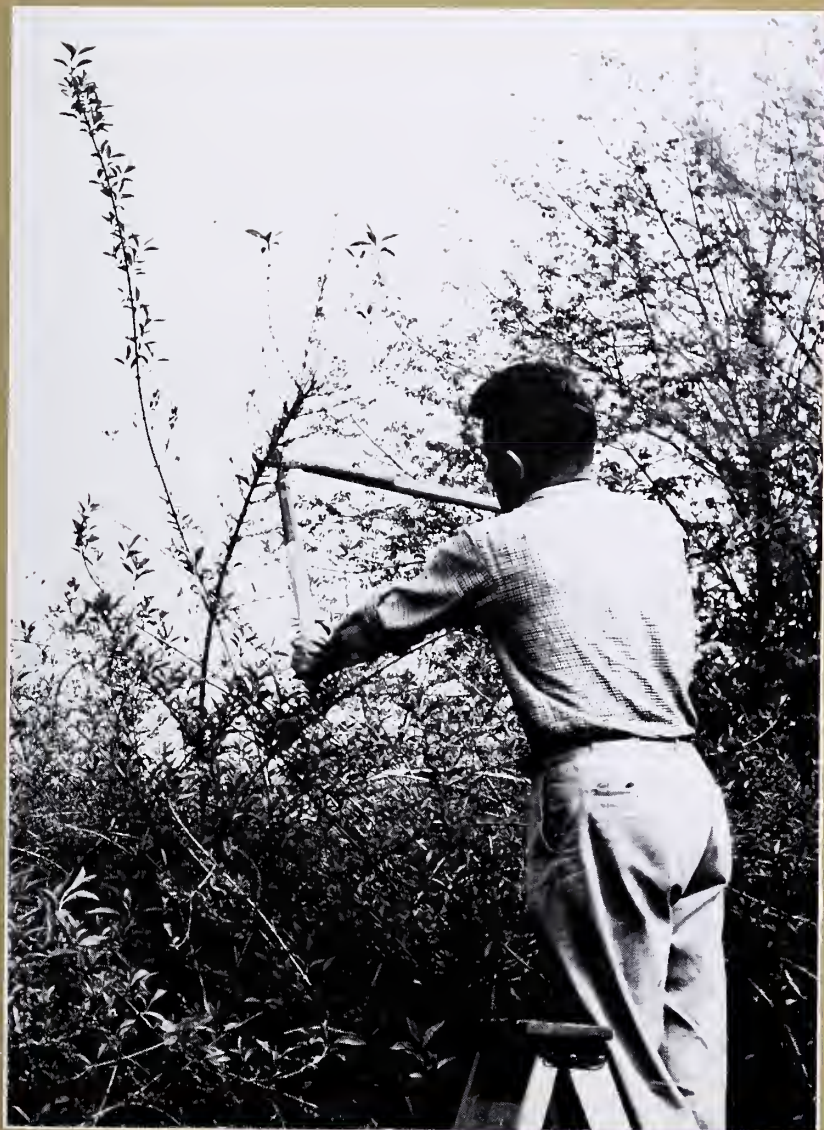
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BROOKLYN BOTANIC GARDEN RECORD

PLANTS & GARDENS

PRUNING

Vol. 37

Summer (August) 1981

No. 2

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Interlaced beech arbor at Colonial Williamsburg, Virginia. This complex form of training and pruning is called pleaching.

LETTER FROM THE
BROOKLYN BOTANIC GARDEN

Pruning is not a cut-and-dried subject. To be sure, there is a technical aspect to it, and this is what is stressed in the relatively few books there are on the subject. We want to learn briefly and without the least bit of nonsense how to prune raspberries for the best yield! But pruning is an art, too. After the arrangement of plants in the garden it is the most important of the horticultural arts, and one about which most people know surprisingly little. I remember once pruning a barberry in the Botanic Garden, a prickly task which more closely approaches one of the martial arts. A visitor came by and watched for a minute, then asked what I was doing. I told him, and without pause he exclaimed, "Oh, so that's where prunes come from!"

Guest Editor Alan Cook and his fine team of collaborators unravel the mysteries of pruning for us in this new edition of a standard title in the BBG Handbook series. Mr. Cook, horticulturist at the Dawes Arboretum in Ohio, has years of practical experience in the field and has managed to keep his sense of humor and fingers despite the crashing of tree limbs, shoulder contusions and willow backlash. Many thanks to Mr. Cook and fellow contributors for bringing us up-to-date on this fascinating subject.

Old pruning ideas die slowly, including the notion that a gardener has to slap thick, gummy paint on tree wounds to make them heal. Arboreal Mercurochrome, so to speak! Alex Shigo (see page 20), one of the leading students of pruning techniques, exposes this and other misconceptions.

Another of the old ideas it is time to scrap is that a tree is worthless if its central leading shoot (leader) has been destroyed. Nonsense—unless you are a forester and want tall timber! More often than not, the grace of garden trees is in their asymmetry, which can be helped along by judicious use of the shears. Think about it—the perfectly symmetrical tree has little character. In this connection the two most important BBG Handbooks to read with this one are *Dwarfed Potted Trees* and *Bonsai: Special Techniques*, for the ancient pruning methods of Japan have plenty of application in American gardens today.

Mistakes can sometimes be turned to advantage, and it is the innovative gardener who thinks two or three times before removing a seemingly worthless shrub or tree. Many years ago at the Botanic Garden, one of the staff members assigned to pruning had a curious notion that only the younger shoots of a shrub should be removed. This was contrary to the idea of "renewal" pruning, the removal of only the oldest shoots. He practiced on the Amur honeysuckle, which has deep, diamond-ridged bark. Successors continued his work and the large spreading shrub with six-inch-wide branches is now one of the handsomest plants in the Botanic Garden.

Let this be a warm invitation to come see the Amur honeysuckle and hundreds of other carefully tended trees and shrubs in the Garden. And Happy Pruning!

Sincerely,

Frederick Mc Goutry

Editor

PRUNING FOR CHARACTER AND SIZE CONTROL

Which Is to Say, Pruning for the
Pleasure of the Beholder

George S. Avery

On one of our early trips to Japan we visited a rural elementary school on Shodo Island (Shodoshima), in the Inland Sea. It was a memorable visit in more ways than one. Our guide and host was the late Kanichiro Yashiroda, long a Brooklyn Botanic Garden correspondent and personal friend. (Mr. Yashiroda was Guest Editor of several special-subject issues of *Plants & Gardens*, and was twice appointed a Teaching Fellow for courses on bonsai at the Botanic Garden.)

Along with all the warmth and friendliness, there is another outstanding item of memory . . . a great multiple-trunked tree on the school grounds, a truly venerable specimen. Its character? Three great trunks that leaned out over the school

playground. Its age? Probably 250 to 300 years. In richness of appearance and inspiration, it offered something of the spirit of bonsai, though a giant in structure.

I wondered then, and I wonder now, how it is that we of the Western world have missed seeing and appreciating the grace of wind-blown trees, or the special qualities of asymmetrical balance, or the charm of multiple-trunked trees. "Specimen" trees with their single formal upright trunks have long been the objective of landscapers and others primarily concerned with street and park plantings. But why have the rest of us failed to venture into the less formal patterns that nature offers us for our own home grounds? Individual tastes will differ, but included



Prostrate hemlock cascades down the edge of a set of stone stairs. Trim any upright leaders.

Photos: G.S. Avery



As this Japanese black pine matures, the graceful branch structure and "cloudlike" form is revealed, giving it the appearance of a giant bonsai.

here are a few examples that suggest an approach to what can be done . . . by those who wish to test their skill.

As for the qualities in woody plants that favor success in pruning and shaping for character, it is of greatest importance to

select species or varieties with fine-textured foliage; large leaves simply are not compatible with attaining quality of skeletal form. If broadleaf deciduous specimens are desired, it is imperative to select varieties whose leaves are naturally small

and with short leaf-stalks (petioles). In general, choose species that have only one leaf at a node. Examples are small-leaved azaleas and Japanese hornbeam. Or, if evergreens are your choice, choose short-needed Japanese white pine, yew, or spruce. Among broad-leaf evergreens, several kinds of Japanese holly are ideal candidates.

If starting with younger plants that you might select at a nursery, the trunk can be shaped by pruning. Simply remove the straight upright-growing leader and leave a side branch at the desired height. As the latter grows from year to year, save the branch or branches growing in the direction desired and clip off the others. This is the secret of developing the desired asymmetrical structure, thus determining the form of the tree-to-be.

Foliage masses (clumps of dense foliage) can, in turn, be developed by cutting out some of the branches, leaving open spaces here and there to show portions of the main trunk or more important side branches. At the same time, shorten all lateral branches wherever dense clumps of foliage are desired, cutting each branchlet back to a bud.

Later, after the plant is older, one needs only to shear the periphery of the foliage masses to maintain them. Paul Takuma Tono, another Japanese Visiting Fellow at the Botanic Garden some years ago, referred to the foliage masses as simulating "clouds floating in the sky."

Pruning and thinning older specimens of low-growing (dwarf) varieties can often bring surprisingly interesting results in just a few years. But a word of warning: for ease of maintenance of varieties that if left unaltered would grow on into large trees, keep them at a workable height. Six to eight feet should be the maximum. I keep a Swiss stone pine (*Pinus cembra*) at six feet and a Japanese white pine (*P. parviflora*) at eight feet. The latter requires a step ladder for its once-a-year grooming. Both trees are something over forty years old . . . and give me considerable pleasure. I could do even more with them than I do.

In summary, if one seeks to develop trees of unusual character for special locations or situations, it takes a bit more than the orthodox know-how of sanitary pruning and thinning. Highly selective pruning is the answer. ✿



Herman Gantner

Extremely symmetrical pruning obscures the shrubs' natural form as well as demanding very high maintenance.



Salvage Pruning

Dr. Avery's article prompts an elaboration about old conifers. Even "dwarf" varieties grow large eventually, and the tendency is to tear them out when they get oversized. Opportunities for pruning artistry are often missed this way.

By Coe Hall at Planting Fields Arboretum in Oyster Bay, New York, are a couple of large old yews which in the normal course of landscaping would have been yanked. Instead, the lower limbs were selectively removed, making distinctive multi-stemmed trees with great bark character. ❧

Pruning for Bark Beauty

Many trees and shrubs with attractive bark tend to grow dense and bushy, obscuring beauty with twigs and foliage. Examples include: lacebark pine (*Pinus bungeana*); stewartia (*Stewartia* spp.); paperbark maple (*Acer griseum*); Persian parrotia (*Parrotia persica*); franklinia (*Franklinia alatamaha*); paperbark cherry (*Prunus serrula*); Amur maackia (*Maackia amurensis*); and serviceberry (*Amelanchier* spp.).

To display the bark of such plants, simply remove lower side branches so that trunks, single or multiple, can be seen. That's simple enough, but often not practiced.

Smaller, twiggy shrubs with bark beauty include: Siberian dogwood (*Cornus alba* 'Siberica'), red bark; red-osier dogwood (*C. sericea*), red bark; Japanese kerria (*Kerria japonica*), green bark; and yellowtwig dogwood (*Cornus sericea* 'Flaviramea').

Since current-season twigs are more colorful than older ones, the best winter effect is obtained by cutting these shrubs back to 4- to 6-inch stubs each spring before growth begins. Recovery is rapid and the following winter season is enhanced by plump, colorful bushes. ❧

PRUNING TOOLS

Alan D. Cook

Hand Pruning Shears: Hand pruning shears are good for branches up to $\frac{3}{4}$ inch in diameter if you have a hand that can make a person cringe during a handshake. If you're the person who cringes, hand shears will get you through $\frac{1}{2}$ inch branches. Unless your shears are topnotch and heavy duty, attempting to cut larger branches can ruin them, and strain you.

There are two cutting styles of hand shears: 1) the snap cut, or anvil cut, and 2) the draw cut, or scissors action. In the first style, a sharpened blade cuts against a broad, grooved blade. In the second, a thin sharp blade slides closely past a thicker but also sharp blade. The latter usually costs more, but makes cleaner, closer cuts. With hand pruners, there's a danger of the literal manifestation. Keep fingers away so the hand pruners prune limbs, not hands. Any victim will testify that at the last instant one will realize some skin is in the wrong place, but one cannot stop in time. Be careful.

A belt-mounted sheath helps keep hand pruners handy.



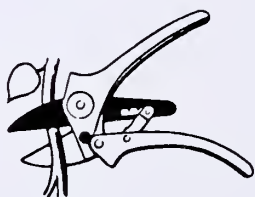
Hand pruning shears
Draw cut, or scissor action



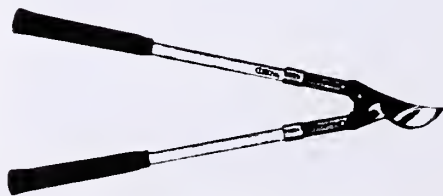
Hand pruning shears
Snap cut, or anvil action



Hand pruner sheath



Ratchet pruner



Lopping shears, or loppers

Ratchet-action Pruner: For hands of limited strength due to arthritis, youth, age, or other, a lightweight ratchet pruner takes tough cuts in short, easy steps. It's not for heavy use, and even with limited use the mechanism that holds the blades shut usually fails. Even so, it's a boon to many.

Lopping Shears: Lopping shears have long handles and are operated with both hands. Even the cheapest can cut $\frac{1}{2}$ inch diameter material; the better ones can slice through branches of 2 inches or more, depending upon species and condition (e.g., pin oak is a great deal tougher than linden, and dead wood is tougher, until decay sets in, than live.)

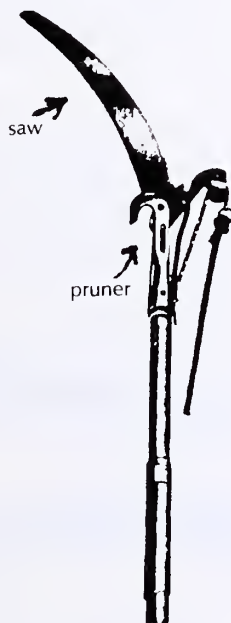


Pruning knife

Pole Pruning Tools: Pole pruners have a cutter with one hooked blade above and a cutting blade beneath. The cutter is on a pole and is operated by a lanyard pulled downward. Pole pruners often have 3 six-foot-long sections that can be fitted together, allowing a six, twelve, or eighteen foot pole. Telescoping poles are also available. Wooden poles are heavy. Aluminum poles are lightweight, but conduct electricity from overhead wires if they touch them, resulting in harm or death to the operator. Fiberglass or other plastic poles are the answer.

Poles can also be fitted with saws, but unless the limb to be cut is firmly fixed, it rides and bounces under saw strokes in a most frustrating manner. If the limb is firm up there, it's usually fairly large, and very dangerous to cut from below. Use of poles with either shears or saws on top also involves danger. With either tool, whatever is cut off must come down (unless it lodges tenaciously among remaining branches). And the saw produces sawdust, which won't put a lump on your head, but is unpleasant in your eye.

Pruning Knife: Pruning knives have heavy, hooked blades. In the hands of an oldtime gardener or nurseryman, a pruning knife is a precision instrument, swift and beautiful. In the clutches of an average suburbanite, however, such a knife has a diabolical will of its own, apt to be dangerous to both the plant and the operator. Unless you're already a skilled practitioner, forget the pruning knife.



Combination pole saw-pruner



Hedge shears
Note shock absorbing device

Hedge Shears: Manual hedge shears have long flat blades and relatively short handles, one for each hand. If you intend to do a lot on hedges or other formal work, get a pair with a shock absorbing device to minimize an aggravation that could be called "pruner's wrist." Heavy duty hedge shears with one blade serrated are best for difficult jobs.



Hedge shears with serrated blade
(see enlarged tip)

Power hedge shears are available with electric, gasoline, and pneumatic power. The commonest for home use are electric models. For light, formal shearing, as on a well-tended hedge, electric hedge shears are fine. One must remember the teeth will cut, whatever applied to, whether parts of

the hedge not meant to be sheared, the power cord, clothing, or flesh.

Gasoline models are not limited by a bothersome cord, but they are noisier and usually more difficult to start than electric shears. Pneumatics run by compressed air and are seldom suitable for the amateur.

Hand Saws: There are scores of makes and kinds of hand pruning saws. Fineness of cutting edge is measured in points (teeth per inch). An 8-point saw is for delicate, close work on small shrubs and young trees. Average saws are about 5½ to 6 points, while 4½ point saws are for fairly heavy limbs.

Folding saws are cute, but if held open and shut with a slotted-head bolt, a screw-driver is required. If blade position is secured by a wingnut, it protrudes from the side of the handle and can scar the trunk when a limb is cut. Too, guess what can happen to fingers if the saw suddenly folds while in use? A fixed-blade saw with a leather scabbard is better.



Double-edged saw



Saw scabbard



Folding saw



Bow saw



Hand saw with
hard-to-handle handle



Hand saw with D grip



Hand saw with pistol grip

Handles are important to those with small or not-strong hands. Many saws have a slightly curved handle that fits no normal hand and requires a lumberjack's grip. Pistol grips and "D" grips are easier to handle.

Curved blade or straight? Many prefer a curved blade that cuts on the draw stroke. A double-edged saw has fine teeth on one side, coarse on the other. And whoever invented the double-edged saw should have to use one in a densely branched small tree. Can't you guess what the upper edge is likely to do to an upper branch while you're cutting a lower one?

Bow saws are good only where no obstruction exists for a foot or more above the area to be cut.

Chain Saws: Chain saws also come in many models, and even those with safety devices can be dangerous. If you're using a chain saw in home pruning, chances are: either 1) you're already knowledgeable about pruning, or 2) it's too late to teach you.

Care of Tools: Keep cutting edges sharp. Sharpen cutting edges of drawcut pruners, loppers, and hand hedge shears on outside only so that inside surfaces that slide against one another are flat. Sharpen cutting blade of snapcut pruners on both sides.

Saws should be taken to a professional sharpener.

Clean and oil tools regularly, including wiping an oily cloth on blades and other surfaces. Follow manufacturer's maintenance advice on power tools.

Use tools properly. Don't twist or strain pruners or loppers. Keep the branch to be

cut as deeply in the jaws, as near the pivot, as possible. Resist the temptation to cut wires with pruning tools. If you do cut wires, most tools have replaceable blades.

Long, vigorous strokes with a saw will cut faster, but if you are a little too eager the tip of the saw may wedge in the kerf on your too-rapid push stroke and you'll have a bent saw blade. A bent saw is a workman's abomination. Straighten it? Maybe. More likely you'll get two bends instead of one.

Treat wooden handles with linseed oil once a month to preclude splits and such that punish hands. Or, better yet, paint all tool handles, wood or metal, bright yellow or orange so you can spot them easily when they hide in the grass. ❀

Some Pruning Geometrics

You want to remove part of a branch from a tree or small shrub, so you turn to written instructions. Unfortunately, many articles, bulletins, and books on pruning give vague advice that goes something like, "Cut back to a lateral (side) branch."

Just any lateral branch? Few references deal with angle of attachment or relative size of an acceptable side branch. Apparently there's been little if any research on either question.

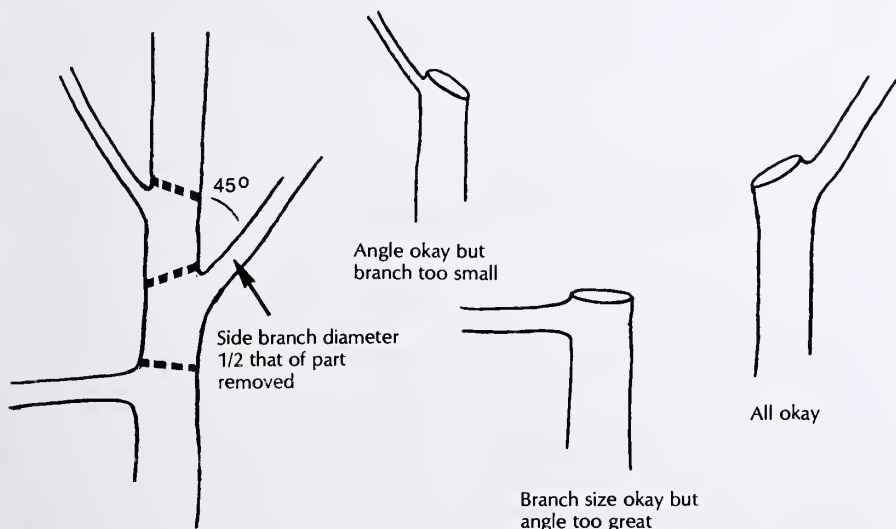
Opinions of a number of experts, however, lead to the suggestion that a side branch to be "cut back to" should form

an angle of no more than 45° with the branch to be removed.

And, until experimentation leads to better advice, the opinion is that the side branch should have a diameter of at least one-half that of the branch to be removed. An angle greater than 45° and/or smaller than a one to two ratio of diameters may result in a cut surface slow to heal, possibly because of inadequate translocation of food and other vital substances.

These two rules of thumb can't always be followed, but they give us something to deviate from if we must. ❀

Eva Melady



PRUNING AT TRANSPLANTING

Elton M. Smith

The gardener's objective at the time of transplanting is to re-establish the plant in the soil as quickly as possible. Proper pruning at this time helps a woody plant to survive the disruption and injuries caused by its removal from the nursery or site where it was grown. The original source of the plant may have a significant bearing on the need for pruning landscape plants at the time of transplanting.

Consider the Source

The majority of landscape plants are produced in commercial nurseries where regular pruning has been a part of the cultural program and the need for more than minimal pruning at transplanting is unusual. Some landscape plants offered for sale have been collected from native stands and these plants have a greater pruning requirement for successful transplanting. In some situations, plants may be moved from one site in the landscape to another and the degree of pruning necessary will vary depending upon size, shade, species, health and other factors.

Nursery-grown plants are routinely pruned one to three times during each year to produce the desired size, shape, density, branch angles and uniformity necessary for quality salable plants. Plants with a longer growth cycle such as trees and evergreens are often root-pruned in the nursery to produce a more compact root system, which increases survival at transplanting. Plants grown in a nursery are often transplanted during various stages of production; this also aids in developing a compact root system. Transplanting of plants raised in a nursery will have a much higher success rate than those collected from the wild.

Plants have been collected from native areas for years and are still being collected by a few in the industry today. Digging at

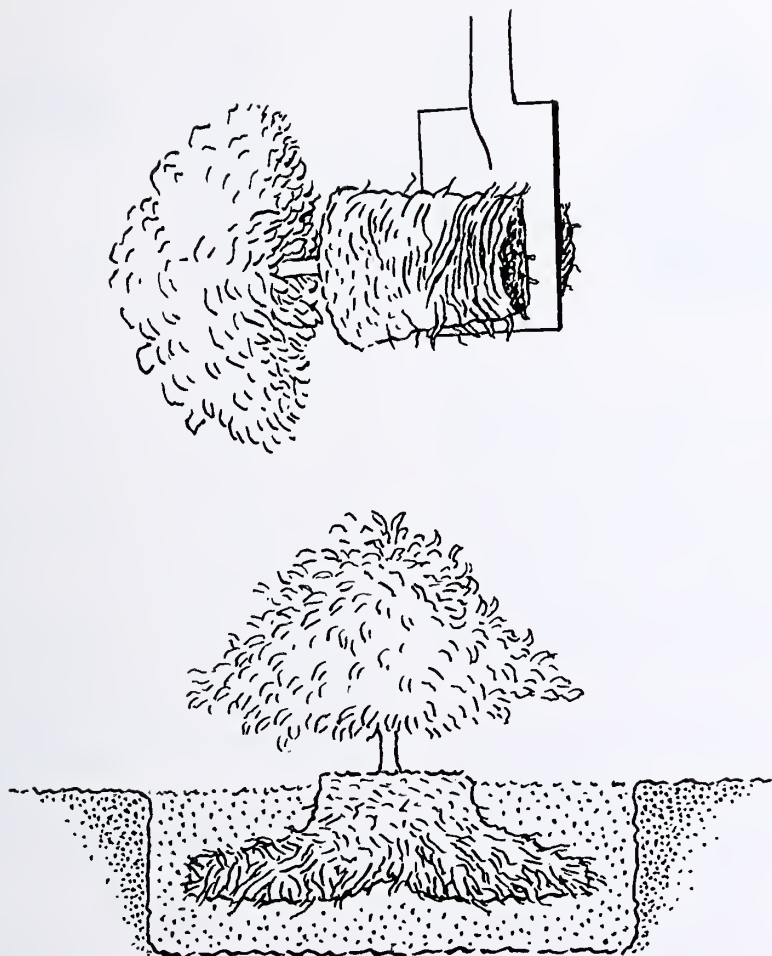
the proper time and advance root pruning of trees leads to higher success rates. The shape of these collected plants, however, is usually not up to the standard of nursery-grown stock, pests have not been controlled, roots have not been pruned and transplant survival will be lower than nursery-grown plants. Pruning practices will be important to shape the tree, to remove dead or pest-infested portions and, most important, to reduce the top growth to compensate for a significant loss of root growth.

Some states have plant labeling laws and it may be required by law to indicate if a plant offered for sale has been collected. If the quality of plants in the sales lot is questionable, be certain to inquire if they have been collected.

Availability of Woody Plants in the Garden Center

Nursery-grown stock in the garden center is available in several forms and variously priced. The form in which they are marketed will indicate the extent of pruning that may be necessary at transplanting. Plants may be sold balled and burlapped (B&B). With these, limited, if any, pruning is required and no root pruning is possible. Trees larger than two inches in diameter are sold B&B as are most field-grown evergreens. Many plants are sold in early spring in bare-root form. These plants are usually lower in price, require some root and top pruning and have a lower transplant survival rate. Deciduous shrubs, as well as trees less than two inches in diameter, are often sold bare root.

For several reasons, container-grown plants have become popular with the gardening public in recent years. Very little if any pruning is necessary with container grown plants. The survival rate in heavy soils may be increased however, if the



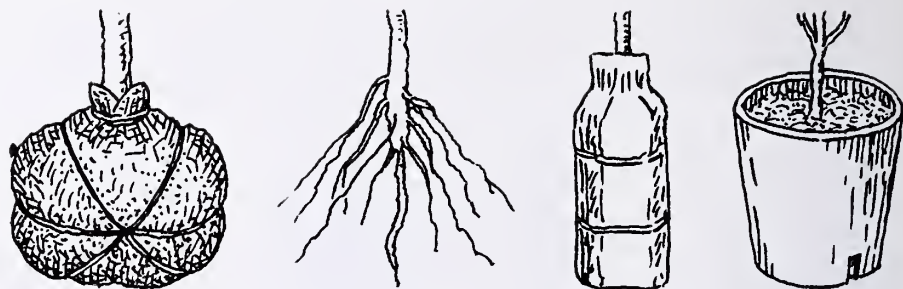
When planting container-grown plants in heavy soils, split the lower half of the root system and spread the roots horizontally. This practice will prune the roots, thus encouraging new laterals, prevent girdling roots and raise the lower roots closer to the soil surface.

lower half of the root system is cut vertically and spread in a horizontal direction when planted.

An increasing number of plants, especially narrowleaf evergreens such as *Taxus* spp. and junipers, are field grown, then dug and potted prior to sale. These should not be treated as container-grown plants. Typically, they can be identified in the retail lot because they are in a fiber composition pot rather than plastic or metal container. Most growers dig these in autumn and overwinter them prior to delivery for spring sale. New root activity will

often occur during this period which is important in transplant survival. Transplant survival is usually quite successful for these plants but not as high as with container-grown plants. Vertical cutting of the root system is not recommended for field-potted plants.

Processed or packaged plants are commonly available in garden outlets during the spring season. These are plants which have been dug bare root and the roots packed in an organic medium such as peat moss or a bark mix and wrapped in plastic. Some may be wrapped with burlap prior



Forms of nursery stock: left to right, balled and burlapped (B&B), bare root, packaged and container.

to the overlap of plastic. Only a minimum of pruning is required at transplanting with these plants because most have been graded and pruned prior to processing.

As indicated above, the extent of pruning required at transplanting will vary depending on the source, previous care, condition and form in which it is offered for sale. However, several growth factors are important to examine at transplanting time and to correct, if necessary.

Trees

The first obvious pruning after trees are received consists of removing broken, crossing and pest-infested branches. Branches that were cracked at the base or otherwise injured when bundled and packed should be removed or shortened.

As a rule, the central leader of a tree should not be pruned unless a leader is not wanted, as is the case with some naturally low-branched trees or where multiple-stemmed plants are desired. Trees with a central leader such as linden, sweet gum or pin oak may need little or no pruning except to eliminate branches competing with the central leader; these should be shortened. Some pruning may be necessary to maintain desired shape and shorten the extra-vigorous shoots.

The height of the lowest branch can be from a few inches from the ground for screening or windbreaks, to seven to twelve feet or more above the ground as needed near a street or on a patio. "Limbing-up" procedures are usually conducted over a period of years beginning in the nursery and continuing for several years after transplanting until the desired height of trimming is reached.

For greatest strength, branches selected for permanent scaffolds must have wide angles of attachment with the trunk. Branch angles less than 30° from the main trunk result in a very high percentage of breakage while those between 60° and 90° have a very small breakage rate according to research in California.

Vertical branch spacing and radial branch distribution are important. If this has not been done in the nursery it can at least be started at transplanting.

Major scaffold branches of shade trees should be spaced at least eight inches and preferably twenty to twenty-four inches vertically. Closely spaced scaffolds will have fewer laterals. The result will be long, thin branches with poor structural strength.

Radial branch distribution should allow five to seven scaffolds to fill the circle of space around a trunk. Radial spacing prevents one limb from overshadowing another, which in turn reduces competition for light and nutrients. Remove or prune shoots that are too low, too close or too vigorous in relation to the leader and branches selected to become the scaffold branches.

The rule of pruning away one-third of the top growth at transplanting to compensate for root loss should not be necessary for properly pruned nursery-grown plants. However, if little pruning had been practiced or the plants were collected, extensive pruning may be necessary to achieve a central leader or desired shape, proper branch spacing and radial distribution. Excessive pruning at transplanting, according to research in Oklahoma, reduces plant size and does not aid in sur-

vival. Trees that should be pruned, however, and are not pruned at transplanting, will prune themselves in the form of natural dieback after a period of time. Corrective pruning at transplanting will reduce or eliminate branch and twig dieback during the months following transplanting, assuming other conditions are optimal.

When transplanting a bare-root tree, the only root pruning necessary should be to remove broken or damaged roots. Do not cut roots to fit them into a planting hole that is too small, but rather increase the diameter of the hole to accommodate the roots without circling them around the inside of the hole.

Deciduous Shrubs

When shrubs are transplanted bare root, some pruning may be necessary. Light pruning of roots may be needed if any are broken, damaged or dead. The branches of shrubs should be pruned by the thinning method, not shearing, to reduce the overall plant size by one-half or more. Research at The Ohio State University indicated that survival and regrowth of deciduous shrubs was increased with removal of one-half or more of the branches of bare-root plants at planting time.

Shrubs transplanted with a ball of soil or from a container require little if any

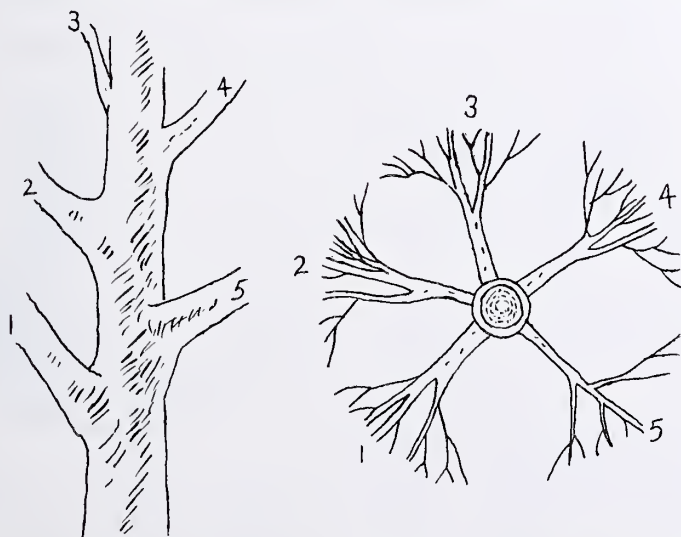
pruning. Occasionally, branches may have been damaged in transit and these should be removed at time of planting. Prune only to maintain desired size and shape.

Evergreens

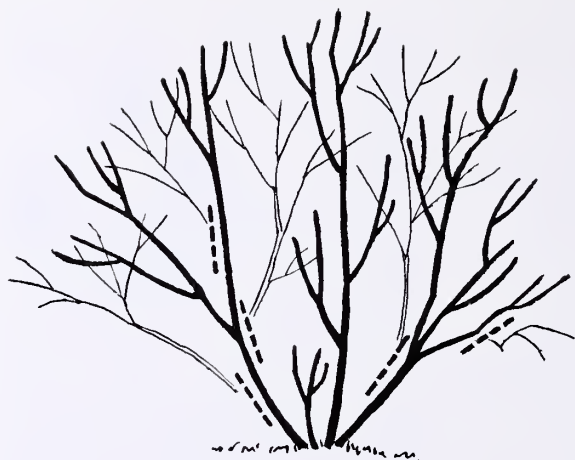
Most evergreens are sold B&B or in a container and, as with deciduous shrubs, little pruning of branches is necessary.

Vertical splitting of the root system of evergreens (and deciduous shrubs, as well) should be considered. Roots of container-grown plants grow much deeper than similar plants in the field because container media have a high air-filled pore space ratio and roots usually grow to the bottom of the container. Planting these bottom roots at the base of a planting hole in heavy soil will result in planting too deep and a lack of air at that depth will lead to the death of those roots.

To increase the survival of these plants, according to research in Maryland, consider cutting the root system vertically with a spade from the base to approximately one-half way towards the main stem. Spreading the cut portions in a horizontal direction results in the roots that were growing in the bottom of the container being raised nearer the surface where soil conditions are more favorable



Scaffold branches of trees should have proper vertical and radial spacing on the trunk to develop a strong and healthy plant.



Lighter branches and dotted lines show how deciduous shrubs should be thinned. Thinning is cutting off a branch where it is attached to the trunk or main stem.

for root growth. Splitting the root system stops the circular habit of growth that the roots developed from growing in the containers and forces roots to develop new lateral roots into the backfill.

In summary, the need for pruning at transplanting depends upon how much pruning had been conducted during the plants growing cycle. The degree of pruning is influenced by size, shape, density, branch angles, presence of insects or diseases and form in which offered for sale.

Prune trees to select a central leader, to limb-up as needed and to provide optimum branch angles and proper vertical branch spacing and radial distribution. Some root pruning may be necessary with bare-root or packaged plants and it's advisable to split the root system of container grown plants to avoid deep planting and prevent girdling roots. Proper pruning at transplanting will assist in transplant survival which is the purpose of pruning at this time. ✂

Girdling Roots Can Squeeze a Trunk

Sometimes a misguided root grows at right angles to the radial direction of normal roots. As root and trunk expand, the root interferes with expansion of the trunk, which becomes flattened on that side above the girdle. Severe loss of vigor can result.

This undesirable condition is common with trees originally grown in round containers which entice roots to grow in circular fashion. Sometimes bare-root trees are forced into undersize planting holes. Roots bent to fit can be girdlers years later.

The cure for girdling roots is the cutting away of as much of the offender as possible without harming other roots. Axe, hand saw, chain saw . . . use any or all. Dig away as much soil as necessary to reduce chances of undue dulling of the tool. ✂



Girdling roots can be above or below ground. If flattening of the trunk or loss of vigor is noted, start digging.

How to Strengthen Young Trees

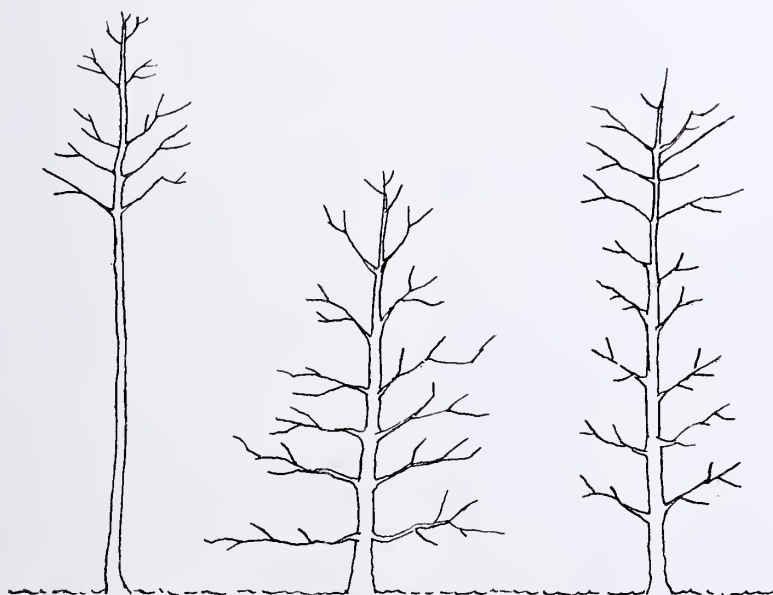
Wind and children exhibit propensities for tipping newly planted trees. Ever since you were young with a bent for tipping trees, folks have used guywires and stakes of myriad manner to hold trees upright.

The problem is, like an arm in a sling, the restricted tree trunk loses strength from lack of flexing and bending. It needs the therapy of the very wind it's braced against. The longer a tree is guywired or staked, the more vulnerable it will be to wind damage when supports are removed. So remove supports as soon as possible, as you would certain garments upon returning home. Spring-planted trees should go on their own by late summer, the next spring at the latest.

In addition, leave lower side branches on the trunk until they become large enough to threaten difficulty in removing. (Suckers from crown or root must go immediately.) A side-branched trunk, unstaked so it can move with the breeze, will achieve maximum girth and rigidity. However, a tree grown this way will be shorter.

For a happy combination of height and trunk strength, leave side branches and cut them back about one-third to a secondary branch. A tree so pruned will be taller than one with laterals left but not cut back, and stronger than one limbed up too fast.

Limbing up is sooner or later necessary, of course. The rate can be judged well if you remember that about one-half the tree's foliage should be in the upper one-third of that tree, and one-half of the foliage in the lower two-thirds, measuring from tip to ground. ❧



Lower side branches removed, trunk weak

Side branches untreated, trunk stronger, tree shorter

Side branches cut back, trunk strong, tree normal height

CHEMICAL PRUNING OF PLANTS

John A. Wott

Chemical control of plant growth, as well as of fruiting, through the use of specific applications of aqueous solutions is a standard cultural practice for many commercial crops. Chemical pruning materials promote branching in plants and eliminate the costly hand pinching or power shearing often required. Also, the possibility of spreading disease organisms through manual methods is eliminated. Although now employed mostly by florists, nurserymen and orchardists, chemical pruning is on the increase in home horticulture.

Chemical Pruners

Apical dominance is eliminated by spray application of chemical pruning agents inhibiting the growth of or killing the growing tip without damaging axillary buds, leaves or stems. This promotes development of lateral shoots. Maleic hydrazide (MH-30) is the most commonly used inhibitory material, employed most often in the production of flowering azaleas in pots. The results of the spray are not immediately seen, as it takes several weeks before the lateral shoots grow.

In contrast, fatty acid esters, chemical pruners of another type, kill the growing point within minutes. The influence on the plant is evident within a few days.

The response of flower crops to chemical pruning agents is influenced by many factors. A vegetative plant with hairy, easy-to-wet leaves and longer, more succulent stems is usually more responsive. Chrysanthemum, forsythia and American elm are good examples of plants that are easy to prune chemically.

Plants with waxy leaves, heavy scales and woody tissue are difficult to prune chemically. Camellias, hollies and most fruit trees respond only to relatively high dosages. Often leaf damage is also observed. Most broadleaf evergreens and conifers are responsive only if sprayed

at a specific stage of plant development.

In general, the chemical must be applied before new growth exceeds one inch in length. Also, the entire plant must be actively growing and the chemical must come into direct contact with the growing points. Cultivars of a given species are not equally responsive to a given treatment.

When spraying, be sure to cover only the growing points with a fine spray. Do not allow excess to run down to the base of the stem, lest stem damage occur.

Before spraying, manually remove any undesirable growth. Plant tissues should be turgid, but foliage should be dry. Apply when conditions favor moderate drying of the spray solution. Evaporation which is too rapid or too slow will cause inferior results. Never spray when temperature exceeds 80°F.

Plants which are chemically pruned often produce more lateral branches than plants which were manually pruned because less tissue is killed chemically than is removed manually. Axillary shoots are generally shorter than those on manually pruned plants. The overall appearance of chemically pruned plants is superior, and flowering often occurs earlier.

Chemical pruning of woody plants usually results in bushier plants if application is made early in the growing season.

Chemical Removal of Fruits

It is sometimes desirable to remove flowers and young fruits to prevent the occurrence of objectionable odors of the flowers or to eliminate the dropping of immature and mature fruits over a prolonged time. Useful chemicals include caustic and hormonal types.

The caustic types such as dinitro compounds (sold as Elgetol, DN-289 and Dinitrol) injure or kill the flower parts, usually the pistil. Maleic hydrazide (MH-30) and chlorophenoxy-propionic (3-CP) can also

Some Suggested Chemical and Pruning Agents

CHEMICAL DESIGNATOR CODE NAME	CHEMICAL NAME
MH	maleic hydrazine (the di-ethanolamine salt of 6-hydroxy-3-(2H)-pyridazione)
Off-Shoot-O	methyl ester of fatty acids (methyl octanoate and methyl decanoate and emulsifiers)
Emgard 2077	methyl ester of fatty acids (methyl nanonoate and emulsifiers)
Atrinal	dinkegulac (sodium salt of 2,3:4,6-bis-O-[1-methylethylidene]hexulofuranosonic acid)
UniRoyal-P293	2,3-dihydro-5-6-disphenyl-1,4-oxathiin

Some Suggested Fruit Thinners

SPECIES	CHEMICAL	CONCENTRATION	TIME TO APPLY
Apple	NAA	15–30 ppm*	petal fall
Crabapple	NAA	20–40 ppm	petal fall
Catalpa	NAA	50–60 ppm	full bloom
Elm	NAA	40–60 ppm	full bloom
Ginkgo	MH-30 or Chloro-IPC	500–1000 ppm	10–12 days after full bloom
Honey Locust	NAA	60–100 ppm	fruit 1–2" long
Maple	NAA	40–60 ppm	full bloom
Mulberry	NAA	50–60 ppm	full bloom

*10,000 parts per million (ppm) = 1% solution

be used. These chemicals have largely been replaced by the hormonal types.

The hormone types include naphthaleneacetic acid types (NAA) (sold as App-L-Set, Sta-Fast or Parmone) and naphthalenacetamide types (NAD) (sold as Amid-Thin). These affect the developing embryo and result in seed degeneration and fruit drop. The results will vary with the tree species and the specific hormone used. NAA is generally effective on the greatest number of species, although the insecticide Sevin can also be used as a thinning agent for some fruit crops.

Be sure to use the correct concentration. Using a concentration too low can cause an even heavier fruit set than normal. Too high a concentration may adversely effect foliage and growing shoots. Time of application is also important. Never apply just before a rain. If applied too late or too

early in respect to fruit development, the results will be minimal.

General Recommendations

Since the effect of most chemical pruning and thinning agents on specific plants at specific times is largely unknown, it may behoove the gardener to conduct his own tests. First prepare one test solution according to the manufacturer's directions. Then prepare a second dosage at a lower concentration, and a third one at a higher concentration. Carefully test individual plants, or individual limbs, making sure to carefully label each as to application. Keep a written record of the results, including weather data and the stage of plant development. Use the best results as a guide for your application next year. 🌿

TO PAINT OR NOT TO PAINT

Alex L. Shigo

Wound dressings do not prevent or stop decay. Results of experiments over a seven-year period that involved dissections of over four hundred wounds on one hundred trees, showed no difference in amount of decay between wounds painted or not painted. Materials tested were orange shellac, polyurethane varnish, a great variety of chemicals incorporated in lanolin, and several commonly used preparations having either an asphalt or bituminous base. Many researchers have shown the high tolerance of wood-inhabiting fungi to many materials contained in commercial wound dressings. The commonly used dressings are primarily cosmetic. Some dressings can be harmful when several heavy coats are applied. The major problem with wound dressings is that they often cover pruning cuts that are made improperly. When pruning is done properly, there is no need for a dressing. Proper pruning is the removal of a living or dead branch at the point where the branch and collar meet. The branch collar must not be removed. A stub must not remain.

Natural Decay in the Wild

Trees, during their 200-million-year evolution, have developed very effective ways of shedding dead branches. Decay is necessary for branch shedding. Decay moves toward the base of the branch. At the base of the branch is an area of trunk tissue called the branch collar. Within the collar is a chemical protective zone. When the decay advancing downward in the branch meets the internal

These cuts are improperly done. The black material that has been applied will do nothing to help this tree.





A cross-sectional view shows a dead branch and collar. Lines show correct and incorrect places to cut. Arrows show internal protective zone. At the bottom of the photo, a dead branch has been removed, new growth has closed over the wound, and healthy wood has compartmentalized an area of discolored wood.



A tree with collars of vigorous tissue at the bases of dead branches. Arrows show where cuts should be made.

protective zone, an area of very strong wood meets an area of very weak wood. The branch then falls away at this point leaving a small zone of decayed wood within the collar. The decay is walled off in the collar. This is the natural shedding process when all goes according to nature's plan. When the collar is removed, the protective zone is removed, causing a serious trunk wound. Wood-decay fungi can then easily infect the trunk. If the pruned branch is living, removal

of the collar at the base still causes injury.

For over half a century the recommendations for pruning have been to flush cut and paint. These recommendations have no basis in scientific fact. The flush cut causes the tree injury which the paint hides. The paint is primarily cosmetic, a psychological treatment for the person doing the pruning, to show that he or she has done something to "help" the tree. It is time for some adjustments based on scientific studies. ❧

Plastic Bandages Aid Tree Wounds

You *told* your teenager to be careful when backing out because the linden tree is close to the drive . . . then *you* put a bumper notch in it.

Dr. Shigo has already explained that tree paint doesn't help (see *To Paint or Not to Paint*). What to do?

Apply black plastic, of course!

From Northeastern Forest Experiment Station, USDA, Durham, New Hampshire, comes a wondrous report from Drs. Walter D. Shortle and Alex L. Shigo indicating the efficacy of 4-mil black polyethelene film when applied to fresh tree wounds.

They deliberately wounded red maple (*Acer rubrum*) trees and applied black plastic (held in place with plastic tape wrapped around the trunk) to some, clear plastic to some, and nothing to others.

Black plastic, when applied immediately, resulted in faster closing of wounds and greatly reduced decay of wood. Black plastic applied two weeks after wounding also reduced decay but did not accelerate closing.

Cleaning away of ragged bark to make the edges of a wound smooth is recommended in any event. ❧

Pruning Diseased Plants

When pruning trees and shrubs that have wilt, canker, fireblight, gall or other diseases that affect some but not all parts of the plant, care must be taken to avoid spreading the disease to healthy tissue.

Don't prune diseased trees when the plant is wet. Water is great for transporting nasty little organisms.

Always cut well below diseased areas into healthy wood, and sterilize the pruning tool after every cut. Methyl alcohol from your drug store is inexpensive, non-staining to clothing, and effective. Dip tools, or apply alcohol generously with a sponge. Also treat gloves and hands.

The old recommendation was to burn the infected prunings immediately. Burning bans make this a problem. If you have a fireplace or woodburning stove, use it. Otherwise, cut into little pieces and stuff into plastic bags. Try not to poke a lot of holes in the bags. Put out with the garbage. ❧

Suggestions for Proper Pruning

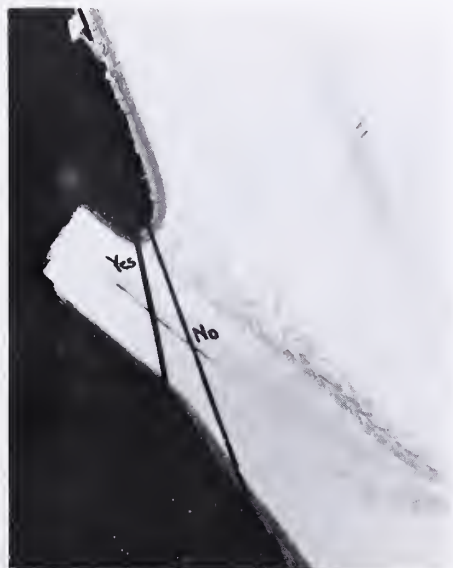
1. When making a cut place the saw or shears *in front of* the branch bark ridge in the branch crotch.
2. Cut from the outer portion of the branch bark ridge down and slightly out, so as not to injure or remove the collar.
3. Use sharp tools.
4. Do not leave a stub.
5. Do not paint, unless for cosmetic reasons, and then use a very thin coat. 🌿

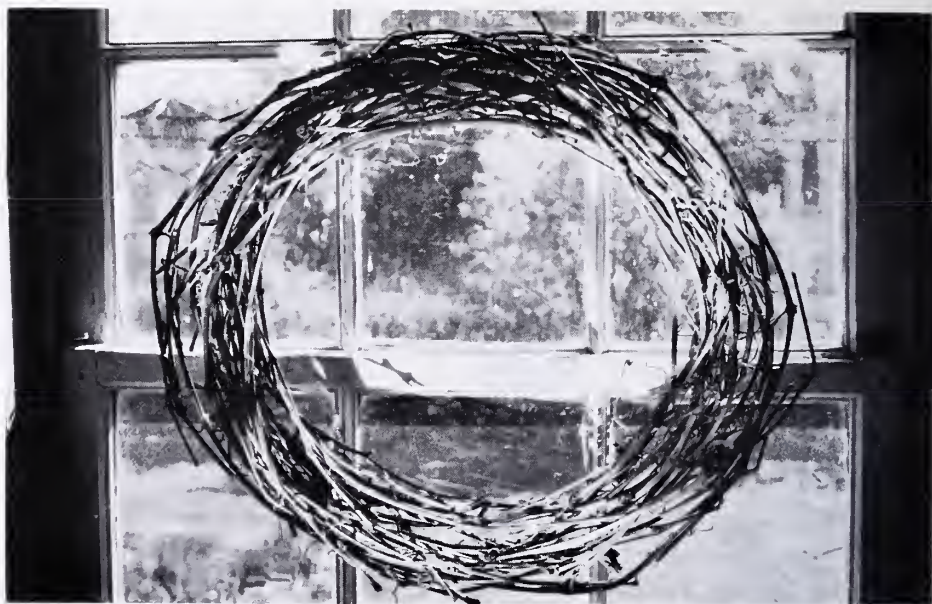
Photos: A.L. Shigo



A dark, thick ridge separates the branch from the trunk on all trees, and serves as a guide in pruning. To avoid injury to the branch collar, place the saw or shears outside the ridge and cut down and out as shown by the dark band painted on the branch. Never cut inside the ridge, the area indicated by the arrow.

Internal view shows how the branch bark ridge separates branch from trunk. A proper cut is placed completely outside the ridge area.





Photos: L.W. Smith

A grapevine-pruning wreath

PRUNING WITH A DECORATIVE EYE

Leona Woodring Smith

With planning when planting, as well as decorative thought when pruning, you can provide continuous indoor beauty for your home. Decorative pruning throughout the year can provide something special in every season—flowering branches in early spring, green leaves for arranging summer flowers, colorful foliage and berries in the fall and greens for the Christmas season. All these and more can be adjuncts to proper pruning of woody plants throughout the year. Who hasn't admired a vase filled with sprays of red-berried holly at Christmastime, or lingered over one filled with blooms of forsythia and pussy willows in February while outside there is still snow on the ground? It may take from several days to several weeks depending on the time of the season and the nature of the branch. But it is a rewarding adventure

to bring indoors a couple of branches from almost any tree, shrub or vine and watch new growth unfold.

Some of the best woody plants for forcing include forsythia, cherry, plum, peach, magnolia, silver and red maple, pussy willow, birch, lilac, flowering quince, dogwood, apple and redbud. To condition the branches for indoor blooming, crush the base of the stems to aid water intake. Place them in a container of warm water and keep in a warm place, but not next to the fireplace, radiator or other heat source, or the buds may dry out before opening. Change the water every 2 or 3 days.

Foliage is essential in all flower arrangements. Judicious pruning of trees, shrubs and evergreens will provide materials all year long for flower arranging. The shape of the branches you cut can provide the

basic outline. Cuttings of graceful cotoneaster, leucothoe, witch-hazel, or laurel will provide natural curves. Pussy willow, ligustrum, juniper or feathery podocarpus offer straighter lines. Snippings of yew, boxwood or juniper will provide the filler needed to add fullness to your designs. Carefully chosen, well-shaped evergreen branches can provide a background that will last through several changes of floral accents.

Autumn and Winter

Fall prunings offer an abundance of decorative material. The showy fruited branches of pyracantha, bittersweet, leucothoe, and cotoneaster provide ready-made bouquets. Colorful leaves such as maple, oak and beech may be allowed to dry naturally or be preserved with glycerin. Burrs (beech), cones (pine, spruce, hemlock, alder), nuts, seed pods (sycamore, goldenrain, magnolia) and spurs (apple) may be saved for making wreaths, swags, plaques and various other craft projects. Prunings from wisteria or grape vines can easily be fashioned into handsome wreaths with a little hand shaping while they are still pliable.

Weathered wood of interesting form is often available from storm-damaged trees. As you prune to aid the recovery of a tree, a discerning eye can spot natural sculptures for decorative uses.

Fresh evergreens add delightful fragrance as well as beauty to any home dur-

ing the Christmas season. Bringing in one's own greenery can be very satisfying to the home gardener and need not relate only to the holidays. An arrangement of mixed evergreens can provide an interesting winter bouquet that will last for months.

Branches from broadleaf evergreens such as holly, rhododendron, mountain-laurel, magnolia, pieris and leucothoe should have basal ends of woody stems crushed to aid water absorption, then be placed in buckets of water and kept in a cool place until needed. Small clippings can be sprinkled with water, packed in plastic bags and kept under similar conditions. Needled evergreens, fir, hemlock, spruce, pine and others are best clipped closer to the time you will be using them. They, too, require cool, wet storage. Wreaths, door swags, kissing balls, roping and other Christmas decorations can be made in advance, sprinkled with water and stored in plastic bags in a cool area.

Prunings from your ivy plants can provide year-round greenery indoors. Gather lots of ivy cuttings (preferably small-leaved) about three inches long and plant a wreath with them by sticking the cuttings into a wire wreath frame packed with moist sphagnum moss. Treated as a houseplant, it will last for years.

Every time you get out your pruning shears, consider the added pleasure and delight that can be yours when you prune with a decorative eye. ❧

Weathered wood recovered from the prunings of a damaged tree has the feeling of driftwood.



TRY AN ESPALIER

Alan D. Cook

An espalier plant is one trained to grow flat against a wall, trellis, fence or other support. In the old European and English traditions, branches were trained to symmetrical and often intricate geometric patterns (Fig. 1). Modern styles, while ignoring symmetry, achieve graceful balance through sweeps and curves as well as random patterns (Fig. 2).

Espaliers may be cultured purely as conversation pieces, but they also can do many horticultural jobs. An eighteen-inch strip of soil between a walk and a garage wall is a spot that calls for a shrub or small tree that's trained tall and wide and very thin. Patio boundaries are amenable to trellis-supported espaliers. Stone walls are often better dressed with flat-trained evergreens than with rampant vines.

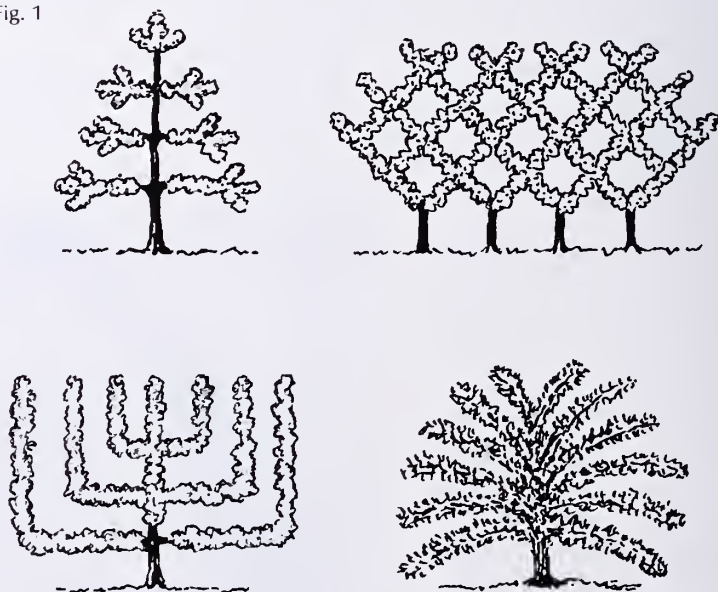
Espaliers also can feature flowers followed often by fruits or berries, and a fence-supported orchard of espaliered dwarf fruits can produce gratifying harvests in very small spaces. Never remove the short fruiting spurs along the branches of fruit trees, unless they become too thick—that is, closer than two or three inches apart.

A Few Things to Keep in Mind

1. On walls, north and east exposures minimize winter damage, but some plants won't get enough light on north walls to perform satisfactorily.

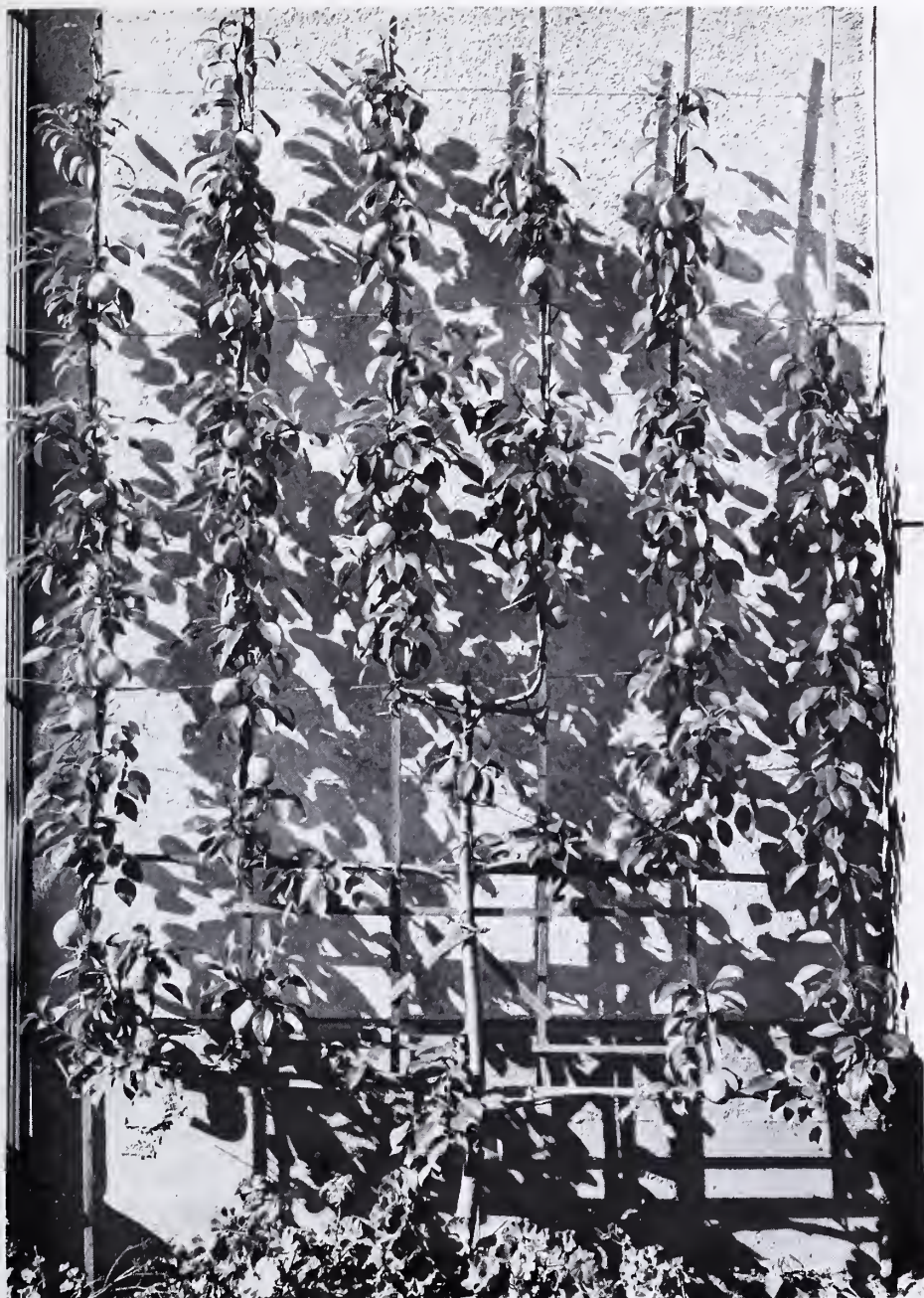
2. Select proper plant for the location. A rhododendron or dogwood, which is shade tolerant, might be suitable for a north wall, but only in well-drained,

Fig. 1



Eva Melady

Espaliering single or multiple plants can be fairly simple or quite intricate. Training must commence when plants are young and supple.



A six-armed pear espalier trained against a sunny wall. For its size, it is producing a surprisingly abundant crop of fruit.

Fig. 2



Modern, more casual, espalier is reminiscent of flower arrangement patterns.

slightly acid soil. Thorny plants would not be desirable beside a walk. Large areas need fast-growing plants. Be sure the plant is perfectly hardy in your climate. Espaliering is time-consuming; gambling with "iffy" plants is better left to conventional culture.

3. Have a definite design in mind and work toward it from the start. Unless, of course, some other design seems better as the original one develops or falters.

4. Heavy yearly pruning is usually best done in early spring, or, on spring-blooming plants, immediately after flowering. Touch-up grooming should take place as often as necessary to maintain desired neatness.

5. As a rule, side shoots should be allowed to grow to about 12 inches before shortening, and a few leaves should be left after pruning. Branches that are a part of the pattern should be tip-trimmed only after they reach desired length.

6. Give thought and attention to methods of attachment. On masonry, drill holes and

cement-in rustproof hooks or eyes. Against wood construction, trellises are advisable for support. Metal rods welded together make fine trellises.

7. Use soft material for tying branches to supports. Pieces of insulated copper wire, soft cord, even strips of lead can be used. Check attachments twice a year and loosen as necessary to prevent constriction of growth.

Suggested Plants

Almost any woody plant can be used for the purpose, but some are superior. A partial list includes: flowering quince, flowering dogwood, cotoneaster, hawthorn, euonymus, forsythia, American holly, magnolia, apple and crabapple, cherries, flowering cherries, plums, pears, pyracantha, yews and viburnum.

For more information, consult your library, or send \$2.85 for Handbook #36, *Trained and Sculptured Plants*, to Brooklyn Botanic Garden, 1000 Washington Avenue, Brooklyn, New York 11225. ❀

Trees to Shrubs, Shrubs to Trees

A small 'Sunburst' honey locust was broken off. On inspiration, the owner, a plantsman by profession, allowed a myriad of shoots to sprout from the base and pruned his one-time tree into a striking shrub. On the other hand, such traditional shrubs as the bushy dogwoods (*Cornus sericea*, *C. racemosa*), viburnums, honeysuckles, and others can be trained into single- or multiple-stemmed small trees with pleasing results.

The tendency for most tree-trained shrubs is to sprout from the base. Diligent pruning coupled with applications of Tre-Hold will keep the sprouts in check. Keep a watchful eye; serendipity can offer chances to create the unusual out of the unlikely. ❀

TOPIARY THE OLD WAY

David Paterson

The plants in the Topiary Garden at Longwood Gardens in Kennett Square, Pennsylvania, are trained and maintained with-

out the use of wire screen and other types of templates or training frames. This can be called "Topiary the Old Way," even

Longwood Gardens Photograph



Topiary Garden at Longwood Gardens. Growth has been permitted at the top of the center specimen so that a bird may be fashioned in the future.



Trees trimmed in a topiary way are a feature of a park in Yucatan, Mexico. Note the graceful trunk structure.

though much of the shearing is done by electric hedge trimmers, and mechanical hoisting devices are used in place of ladders and scaffolds whenever possible.

Various forms of yew (*Taxus* spp.) are the only plants used for this specialized type of training at the present time. Spreading Japanese yew (*T. cuspidata*) and the ascending-branched sort (*T. c. 'Capitata'*) are used for mounded forms and upright forms respectively. *Taxus x media* 'Densiformis' is used for some of the horizontal forms. These react well to heavy pruning. They grow rather slowly compared to some other plants that are commonly used for topiary, but this is eventually an advantage because finished specimens need to be trimmed only once a year with an occasional touch-up with hand pruners.

Before training begins it is essential to choose a plant with a habit of growth that lends itself to the desired shape. In developing forms such as animals or birds, the pruning is done freeform using pruning

shears. This involves making a few cuts, then standing back to survey the progress being made, and repeating that process until the desired results are achieved.

For a geometric design, parallel lines of mason's cord or similar material are positioned on the plant to designate the desired configurations. The branches outside the sets of lines are pruned away to produce the design. The unpruned areas may be allowed to grow for another season before they are shaped to conform to a sketch which was prepared prior to any pruning.

One of the advantages of this system is that it is fairly easy to change the design or shape or to add a feature to the topiary. For example, it was decided to add birds to the tops of four existing columnar topiaries. We simply allowed the top portion of the plant to grow without pruning for a few years until we had enough untrained growth to work with. After two years of pruning, the bird shapes are becoming discernible. Next year they should be completed.

THE CHLOROPHYL ZOO— WALT DISNEY WORLD TOPIARY FIGURES

Lake Buena Vista, Florida—A podocarpus sea serpent guards the moat around Cinderella Castle. An arborvitae elephant,

a Brahma bull of 'East Palatka' holly and a herd of chlorophyll animals seem to graze in fields of annuals at the monorail station.

©Walt Disney Productions



Wire forms guide gardeners in shaping the intricate topiary figures at Walt Disney World.

And creeping fig statues of Mickey Mouse and Donald Duck greet visitors headed for the Walt Disney Magic Kingdom.

Disney artists, having given life to hundreds of characters on the screen, are now adding a new twist to the age-old practice of topiary gardening.

The idea was developed by Walt Disney, who always had an eye for show. Disney felt that he could enlarge upon the topiary gardening techniques he had seen in Europe, so he combined the talents of his film animators with those of the Disneyland landscaping department. The result first



Walt Disney World tree farm superintendent Katy Warner oversees the topiary collection, including the podocarpus Goofy.

appeared in Disneyland's Fantasyland area in 1963. The figures were later moved to their permanent location in the forecourt of "It's A Small World" in 1966.

At Walt Disney World, where more than one hundred topiary figures line transportation routes outside the Magic Kingdom and grassy slopes near Cinderella Castle, the process began three years before the resort's 1971 opening and is still going on at the Walt Disney World tree farm under the direction of superintendent Katy Warner. The shapes are dreamed up by Disney artists with flairs for animation. Their drawings become blueprints for metal sculpture, lightweight wire frameworks which provide a subsurface base.

With the greenery confined to individual planters, the gardeners train the plants to the frame. Once the figure has matured, foliage is maintained three inches from the frame. During the peak growing season, the figures are clipped every week. The Disney topiaries are rigged with a drip irrigation system through which a slow-release 20-20-20 fertilizer is applied.

Due to the unusual shapes, the landscapers often have to adapt to a variety of situations. For example, a camel with four feet on the ground requires four individual shrubs, the longest and most appropriately shaped one becoming the neck and head.

On the other hand, if a hippopotamus is poised on one toe, the problem is intensified since all appendages must come from a single plant.

Creatively, they have pruned the topiary materials so that a trained seal of Yaupon holly (*Ilex vomitoria*) tosses a pink azalea ball, a dexterous Yaupon elephant balances on a *Photinia x fraseri* ball and green Japanese privet frogs perch on variegated mushrooms of *Ligustrum* 'Silver Star'. A Yaupon Mary Poppins carries a shocking pink bougainvillea umbrella while a flock of *Podocarpus macrophyllus* penguins wear vests of Texas silverleaf (*Leuco-phylлум frutescens*).

For quick growth, Katy and her crew use an entirely different technique, filling the wire frames with sphagnum moss and planting them with close growing vine material, primarily creeping fig (*Ficus repens*) and English ivy (*Hedera helix*).

The topiary figures have become so popular with guests at Walt Disney World that they are almost an attraction in themselves, constantly being snapped by both amateur and professional photographers. They provide a perfect addition to the fanciful world of the Magic Kingdom, where cartoon characters come to life at the flick of an artist's brush or a gardener's shears. ♣

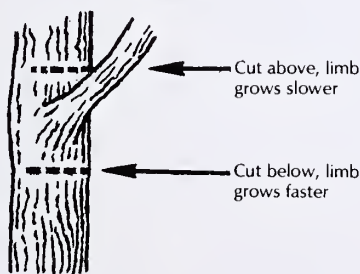
Control Limb Growth by Cutting Cambium

If a cut is made through the cambium layer in a tree trunk above a limb, that limb will grow more slowly. (Cambium is the slippery layer between bark and wood.) A similar cut beneath a branch will cause faster growth.

Why? Sugar manufactured in leaves and growth-promoting chemicals produced in terminal growing areas are translocated downward in phloem tissue on the bark's side of the cambium layer. A cut above a branch cuts off the supply. A cut below a branch traps it, availing the branch of extra nourishment.

Make cuts with a knife or fine-toothed saw sterilized with rubbing alcohol. Cut through the bark and just into the wood.

CAMBIAL CUTS



On each side extend cuts an inch beyond limb diameter. An ideal time is just as buds are breaking in spring.

ROSE PRUNING

Peter Malins

All roses need some type of pruning. If roses are not pruned for a number of years, plants deteriorate in appearance and often develop more than the usual disease and insect problems, while the flowers become smaller and smaller.

Hybrid Tea, Grandiflora and Floribunda roses require annual pruning in the spring after winter protection has been removed. There is an old saying that roses are pruned when the forsythia blooms. In the New York metropolitan region this is late March or early April. In very cold parts of the country, prune roses in late April. If rosebushes are pruned too early, injury from repeated frost may make a second pruning necessary.

Tools and Supplies: For small pruning jobs, the only tools necessary are sharp pruning shears and gloves. If the rose collection is larger, a small saw with pointed blade and loppers will help. Loppers are used to reach in and cut out large dead canes.

To discourage borers, I like to apply tree surgery paint or rose wound dressing to seal the cuts. Where roses are infected with brown canker, carry a can of denatured alcohol to sterilize shears after each cut.

Reasons for Pruning: Prune to remove branches that are dead, damaged, diseased, thin, weak, and growing inward, and branches that cross or interfere with other branches. New growth from the base is encouraged, making the plant healthier and more attractive and resulting in larger blossoms.

Steps in Pruning: Remove all dead and diseased wood by cutting at least one inch below the damaged area.

Remove all weak shoots. If two branches rub or are close enough that they will do so soon, remove one. On older, heavy bushes, cut out one or two of the oldest canes each year.

Cut back the remaining canes. The height to which a rose should be cut back

will vary depending upon the normal habit of the particular bush and the personal preference of the gardener. The average pruning height for Floribundas and Hybrid Teas is between 12 and 18 inches, but taller growing Hybrids and most Grandifloras may be left at 2 feet.

Make cuts at a 45° angle above a strong outer bud. Aim the cut upward from the inner side of the bush to push growth outward and promote healthy shoots and quality flowers.

Standard or Tree Roses: A tree rose is a Hybrid Tea, Grandiflora, or Floribunda budded at the top of a tall trunk. Tree roses usually require winter protection in the North. Roots are dug loose on one side and the "tree" is laid on the ground or in a shallow trench and covered with sandy soil, or a sand-peat mixture, over winter. Prune tree roses as you do Hybrid Teas, cutting the branches to within 6 to 10 inches of the base of the crown in order to encourage rounded, compact, vigorous new growth. Tree roses should be pruned immediately after they are set upright in the spring.

Miniature Roses: Miniatures are 6 to 12 inches high, with tiny blooms and foliage. Miniature roses do not need special pruning. Just cut out dead growth and remove the hips.

Ramblers: The old-fashioned Rambler roses have clusters of flowers, each usually less than two inches across. They often produce pliable canes 10 to 15 feet long in one season. Ramblers produce best on year-old wood, so that this year's choice blooms come on last year's growth. Prune immediately after flowering.

Remove entirely some of the larger old canes. Tie new canes to a support for the next year.

Large-flowering Climbers: Climbing roses have large flowers, more than 2 inches across, borne on wood that is 2 or more years old. Canes are larger and sturdier than those of Ramblers. Some flower

just once in June, but some, called ever-blooming climbers, flower more or less continuously. This group should be pruned in autumn, any time before cold weather sets in. First cut out dead and diseased canes. After this, one or two of the oldest canes may be removed each season at ground level to make room for new canes. The laterals, or side shoots, are shortened 3 to 6 inches after flowering. If the plant is strong, keep five to eight main canes,

which should be tied to the trellis, fence, wall, or other support.

Pruning is an art: Prune with common sense. No particular technique is the only correct one. Any good rose gardener will find his own method. Pruning becomes an art, and you will learn from experience just how each plant should be handled. If you make a mistake, the plant will not die, and in time you will discover just what will produce the most and the best blooms. ❀

Herman Gantner



Prune out dead or oversized stems, spindly, over-long shoots and tops for denser, more floriferous shrubs.



Don't Be Suckered

That nice pink-flowering crabapple by the patio has strong sucker growth coming from the base of the trunk. The named variety maple in the side yard has the same condition.

Most tree cultivars are grafted or budded, resulting in roots of different genetic material from that of the top. Suckers from the roots are undesirable, so we cut them off. But they grow back, more numerous than before. The advent of propagation by cuttings of cultivars of shade and ornamental trees may someday eliminate the problem. But, for now, it's with us.

Three hints may help reduce the frustration of rootstock suckers. First, do the pruning in summer (July, in Ohio) when food reserves of roots are low. Second, cut the suckers at point of origin, or as close as possible. This may mean some pesky digging, but do it. Third, treat the cut surfaces on the tree roots or trunk with a sprout inhibitor. A product available in handy aerosol cans is Tre-Hold, a product containing naphthaleneacetic acid in asphalt emulsion.

Do this every summer and your suckers will be increasingly fewer until you can skip a year or two. ✂

PRUNING TREES

Robert A. Bartlett

Nature prunes trees in her own ways. Weak or dead limbs eventually break off. Weather, in the form of heavy wind, lightning, ice or snow, haphazardly tears off branches leaving ugly open wounds that can invite disease and insect problems. A well-planned program of pruning serves the tree much better. This is one of the few instances where man can improve on nature.

Pruning shade trees involves the removal of dead, diseased, damaged, interfering, suffocating or superfluous branches. There should always be a sound reason for the removal. Each cut must be made properly, and pruning must always be done with full regard for the health, appearance, strength, and growth potential of the tree.

Reasons for Pruning

There are eight primary reasons for pruning shade trees: safety, sanitation and health, structural enhancement, character and beauty, corrective guidance, space restriction, balance of the crown with the root system, and vista clearance.

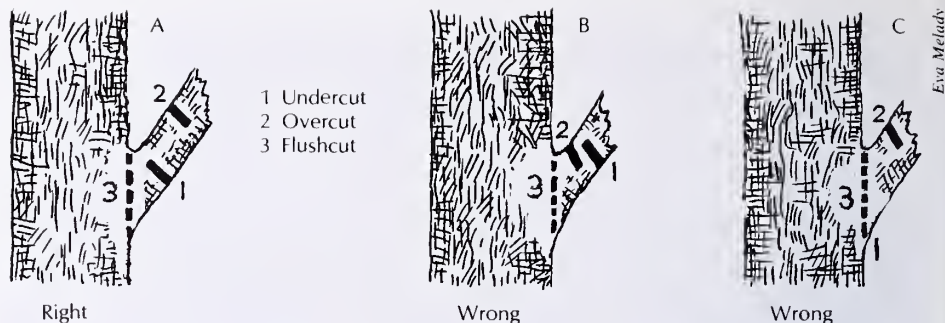
Human safety is always of primary importance. Branches that are likely to fall on people, structures or roadways must be lightened, supported or removed. Thick crowns that could catch the wind like a sail must be thinned out.

Sanitation includes the elimination of dead or diseased and dying wood. Parts of the tree that harbor killing diseases and boring insects must be removed. Sanitation is one of the most effective ways of

Photos: R. A. Bartlett



Photos 1 and 2. Pruning a young tree can encourage good strong branch structure and handsome form as it grows and matures.



dealing with Dutch elm disease and many other tree ills. Any dying branch or stub can be the entry point or build-up chamber for the insects, borers or fungus that could spread to other parts of the tree.

Wood is very heavy. Structural strength is of vital consideration. Weak crotches should be cabled or braced, but sufficient weight should also be taken off these branches, and awkward angles eliminated, to assure that the cables will hold under extreme conditions. Lopsided trees should have their heavy side lightened to obtain better weight distribution. Occasionally it will be necessary to lower the height of a tall tree to bring its center of gravity down, especially on shallow-rooted trees growing in soft or wet soil.

Each tree species has its own character. American elms are famous for their vase-like shape, willows for their cascading symmetry and beeches for their spreading crowns. Pruning should always be aimed at the maintenance or improvement of a tree's character, even in the event of abnormal growth, storm damage, or other circumstances.

Guidance pruning, especially of young trees, can eliminate future weak V-shaped crotches, encroaching on wires, structures or other trees, or the spreading out of the tree into areas where it shouldn't grow. A young tree can be trained to assure future strength through uniform branching and proper placement of leaders (see photos 1 and 2). Corrective pruning will also assure that heavy upper foliage will not shade, and eventually kill, lower branches, reducing the tree to the shape of a huge umbrella.

Space restrictions by buildings, wires, other trees, or traffic needs are usually the

result of unfortunate introduction of obstacles into the space needed for normal development of existing trees, or the planting of trees too close to existing obstacles. In either case, the problem must be dealt with. The artistry and skill of the tree surgeon is never more taxed than in this area of pruning.

A tree whose roots have been injured by construction or natural causes such as drought should have its crown balanced to its root system. A tree with a big crown cannot be sustained by a root system that has suddenly been abbreviated.

Vista pruning can open up a space to allow enjoyment of meadows, gardens, lakes, rivers, valleys or mountains.

Basic Pruning Techniques

Thick heavy branches must be removed flush* with the stem or supporting branch, leaving no stub to die back later. This is accomplished by first making an undercut from the bottom of the branch about 6 to 12" out from the trunk and about one-third of the way through the branch using a sizable hand saw or chain saw. Next, make a second cut from the top, about 3" further out from the undercut, until the branch falls away. The resulting stub can then be cut flush with the stem (see photos 3 and 4 and diagram 1). If there is danger of the branch damaging other limbs below, or objects on the ground, it must first be properly roped and supported, then carefully lowered to the ground after the second cut.

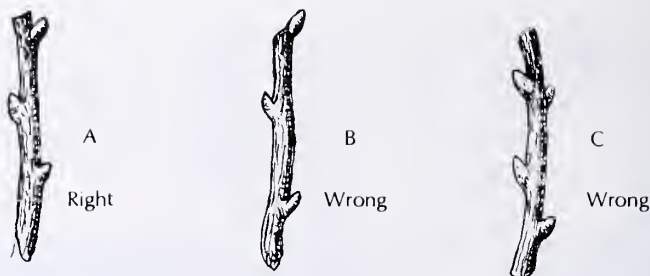
Small limbs and twigs can be cut off in one stroke with a hand saw, pole pruner, pole saw or hand shears, depending on the size and location of the limb. Sucker

*See p. 23 for more information—Ed.



Above, making the second of three cuts to remove a branch. Below, the third, flush cut.





growth (young shoots extending straight up from a branch) is usually removed in this fashion.

In pruning twigs and small branches, always cut back to an intersecting branch or to a vigorous bud (see diagram 2). This promotes healing of the wound and prevents dead stubs later. Slanting cuts should be made when removing limbs that grow upward; this prevents water from collecting in the cut and expedites healing. However, be careful not to cut too deeply or the remaining branch may be weakened at the point of the cut (see diagram 3).

All cuts on branches of 2" or more in diameter can be painted over with a properly formulated black tree paint or wound dressing. There is some question today as to whether this really is effective in repelling fungus spores, insects and moisture, but it certainly does no harm to the tree and lends a professional look to the pruning job. Evergreens exude resins that ooze down the stem from the cut, making an unsightly white blotch. This can be partially controlled by applying tree paint to the fresh cut.

Thinning the crown must be done judiciously. Over-pruning may open up the tree to intense sunlight, especially on the south and southwest sides. Thin-bark trees

such as maples and beeches are very sensitive to the sun, which can scald and kill their bark. When severe pruning is called for, do it a little at a time over a period of a few years.

When to Prune

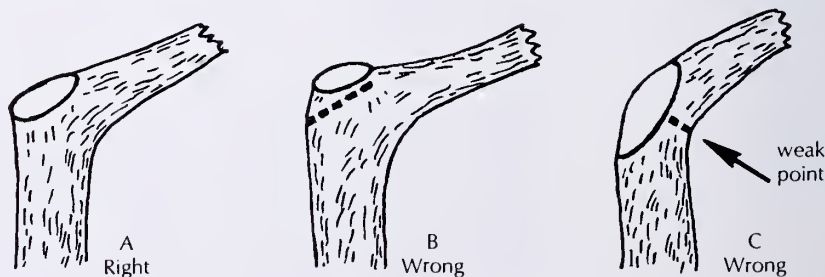
Trees can be pruned at any time of the year. A few trees bleed profusely when pruned in late winter. Among these are the sugar maple, birch, black walnut and flowering dogwood. The bleeding has no harmful effect except to be unsightly.

Mountain-ash, hawthorn, pear and apple are all susceptible to fire blight and should be pruned only in dry weather. Sterilization of tools between cuts with methyl alcohol is an added precaution.

In winter, an experienced tree man can easily distinguish between live and dead wood. Winter pruning is often preferred because it is easier to visualize shaping without the obscuring foliage, and such work can also be done at lower cost to the owner because of fewer precautions necessary to avoid lawn, garden and flower bed damage and the cleanup is much easier without foliage.

Effects Come Later

The results of a good pruning job come in



subsequent seasons. Pruning invigorates the growth of remaining branches. Matching the crown of the tree more closely to its root system provides better concentration of the tree's vigor, which otherwise had been diluted over a large area. In cases of severe pruning, it must be remembered that the tree will fill out again in a while

and regain a more pleasing appearance.

In all but the simplest of tree pruning, a reputable professional arborist should be engaged. Heavy limbs, high pruning, work near wires, branches over buildings or traffic, and other such pruning challenges are beyond the skills and equipment of the layman—Ed. ♪

Topless Trees Are Indecent

“Topping” of trees is indecent.

If a tree is growing too large for a given site, it's the fault of the person that planted it there, not the tree. Topping doesn't solve the size problem, it creates ugliness, and it creates new problems.

The immediate result of truncating a major trunk or limb is either dieback to the stump or prolific new upright shoots from just below the cut, forming a “broom.” The large wound amid the erect sideshoots usually decays, leaving the new branches vulnerable to breakage by wind.

Indeed, a few years after topping, the density of branches and leaves is greater than ever and the entire tree is vulnerable because wind doesn't pass through as it would a properly pruned tree, so breakage or uprooting is more likely. ♪



A few years after topping, brooms of unnatural new shoots have formed a dense, awkward canopy.

PRUNING BROADLEAF EVERGREENS

Fred C. Galle

The basic principles for pruning broadleaf evergreens are the same as for deciduous shrubs. As a rule, to avoid a prolonged sheared look, prune in early spring just before new growth starts. Except for hedges and for special effects, prune to the natural shape and growth habit of the plant. Most of the broadleaf evergreens can receive corrective pruning and light pinching to increase branching at any season of the year.

Old leggy, multiple-stemmed plants, such as privets, hollies and camellias, can be sculpture-pruned into beautifully formed, large shrubs or small trees by removing lower branches. Thinning out the crown and removal of suckers or feather growth will also increase the attractiveness of large old plants.*

If complete rejuvenation is required, it should be done in late winter or early spring by cutting the plants at six to eighteen inches from the ground. The strong vegetative growth that subsequently develops in the spring will require thinning and pinching to develop compact plants.

The use of evergreen branches at the holiday season is enjoyable, but remember, if you prune too heavily, you'll have three to four months to look at a chopped evergreen shrub before new growth starts.**

Hollies and Osmanthus

Hollies, depending upon species and cultivars, vary from densely conical or rounded to open and multiple-branched. Observe the natural shape and prune to enhance the habit of growth. Pruning of fruiting branches at Christmastime provides material for holiday decorations.** Keep in mind, however, that some hollies

produce fruit on old wood; you will be removing flower buds that were produced in late summer. Hollies in this group include lusterleaf holly (*Ilex latifolia*), English holly (*I. aquifolium*), and Chinese holly (*I. cornuta*) and its many cultivars such as 'Burfordii.' Heavy pruning of these in winter will reduce the abundance of fruit the next season.

In contrast, most hollies produce fruit on current season's growth. This group includes hollies indigenous to the United States—American (*Ilex opaca*) and Yaupon (*I. vomitoria*), and some introduced hollies, such as *I. chinensis* and *I. pedunculosa*. Moderate pruning of fruited branches from these plants will not affect fruit production for the next season.

Japanese holly (*I. crenata*) and inkberry (*I. glabra*), both of which have relatively inconspicuous black fruits, should be pruned in early spring before new growth starts and touched up once or twice during the growing season as needed, especially if used as hedges.

Osmanthus species of foreign origin, such as *O. fragrans*, *O. heterophyllus*, *O. x fortunei*, *O. armatus* and *O. delavayi*, are prized for their attractive foliage and their fragrant creamy-white flowers in late fall and winter. Cutting of small flowering branches allows one to enjoy the delightful fragrance indoors. Heavy pruning, if needed, should be delayed until early spring.

Osmanthus americanus, (devilweed), a native to the United States, flowers in the spring on old wood and bears fruit in the fall. Thus, early-spring pruning reduces flowering and fruiting, but pruning after flowering reduces fruiting. Take your pick!

Camellia and Pyracantha

Camellias are generally pruned in late win-

*See Avery article p. 4.

**See Smith article p. 24.

Vegetative bud on rhododendron. Each bud will make one shoot.



Bud in center of above photo has been removed. Small buds in leaf axils will grow and a bushier plant will result.

ter and early spring after flowering. Summer pruning of leggy growth is often required to keep plants compact. Old leggy plants can be sculpture-pruned to a treelike form or rejuvenated completely by cutting off all branches 6 to 12 inches from the ground. This is a drastic treatment and not all may respond to this heavy pruning. For these special old-timers it is best to extend the rejuvenation over a three-year period by removing a third of the branches each year.

The new vigorous growth from cut-back plants will require thinning out some of the excessive growth and also pinching of the new shoots to develop lateral growth.

Disbudding of flower buds from some *Camellia japonica* cultivars is often required to produce better flowers. Some cultivars develop a considerable number of large rounded flower buds that should be thinned out to produce perfect specimen blossoms. Care should be taken in removing the large flower buds to avoid disturbance of the long slender leaf buds.

Camellia sasanqua and *C. reticulata* plants seldom need to be disbudded. Old blossoms and swollen fungus-diseased leaves should be removed and destroyed.

The blossoms and fruit of pyracantha (firethorn) are produced on short spurlike branches from two-year-old wood. Thus, heavy pruning in any one year will reduce the colorful berry crop that fall. Spring and summer pruning of new growth will aid in keeping vigorous plants in bounds. Young pyracantha plants should be pruned or pinched regularly to develop compact shrubs. Pyracantha is often used as clipped hedges, and sometimes trained as standards and into topiary. Such pruning reduces the colorful berries. Most cultivars are vigorous, informal plants and should not be planted in small areas that dictate continual pruning to keep in bounds. For confined areas, use the less vigorous dwarf varieties. Diseased brown leaves and branches resulting from fire blight should be removed by cutting back into fresh, disease-free stems. Pruning tools should

be sterilized with alcohol after each cut to prevent accidental spread of the disease.

Ericaceous Plants

Mountain-laurel (*Kalmia latifolia*) and pieris (*Pieris japonica* and *P. floribunda*) produce flower buds on old wood and should be pruned after flowering. Old, overgrown specimens of these species can be renovated by severe pruning in late winter or early spring. Both heath and heather (*Erica* and *Calluna*) are best pruned by removing flowers as they fade. Ragged or out-of-bounds old plants can be cut back in spring or summer.

Rhododendrons and azaleas may require annual pruning to develop shapely plants. Most evergreen azaleas become neat, compact shrubs and will respond to annual light shaping after they finish flowering. Old azaleas and rhododendrons can be rejuvenated by cutting back drastically in early spring, sacrificing flowers for that season.

Rhododendrons that appear thin and leggy can be thickened by pruning off the terminal rosette of leaves to just above a lower rosette of leaves, not leaving a long stub. New vegetative shoots will develop from the dormant buds at the axil of each leaf of the rosette.

Disbudding, the removal of leafy growth buds with thumb and forefinger, is an easy

method to develop compactness on young plants, but time consuming on large ones. Once the terminal leaf bud is removed, dormant sidebuds will develop at the end of the branch. Flower buds are larger and more rotund than the tapered, slender leaf buds.

Deheading of rhododendrons is the removal of old flower trusses before they develop seed capsules. Failure to do this often results in the rhododendron producing a good display of flowers only in alternate years. This does not apply to azaleas or small-leaved rhododendrons.

Others

Boxwoods are most attractive with their dense billowy habit. Light pruning and pinching of new growth will increase branching.

The beautiful evergreen daphnes generally require little pruning except cutting of the largest stems of early spring fragrant flowers to use in the home.

Mahonias and nandinas often get leggy and bare at the bottom as they mature. An annual removal of a third of the old canes at ground level in early spring will allow new leafy shoots to develop, forming fine specimens after three years. When not many canes are present, a complete rejuvenation can be obtained by cutting off all the leggy canes at one time. ✂

Post-Pruning Therapy

While animal wounds heal by regeneration of tissue within the wounded area, precisely speaking, plant wounds don't heal. Tree and shrub wounds can be covered by new growth, but the damage remains, usually compartmentalized by natural processes in wood. If covering by new tissue is rapid, probability of decay is minimized, so pamper your post-surgery patient. Apply a generous mulch of organic matter to temper soil temperature and moisture and to reduce competition from grass and/or weeds. Mulching also reduces chances of lawnmower damage.

Provide an inch of water per week during dry spells. Use a sprinkler (intermittently, if necessary, to avoid runoff,) and put a flat-bottomed straight-sided pan close by to catch water for measuring.

Fertilize. Use a balanced garden fertilizer at the rate of two or three pounds per one-hundred square feet of area beneath the "drip line," or branch spread. Scatter it evenly on top of mulch or soil (if there's grass, then you'll be fertilizing grass, not the woody plant). Don't till fertilizer into soil if there's any chance of damaging roots.

Inspect regularly, watching for diseases and harmful insects. They are most easily treated when they first appear. Identify the problem and attack it with a recommended material or method. Follow directions. ✂

PRUNING CONIFEROUS EVERGREEN TREES

Freek Vrugtman

A tree looks best when it attains its natural size and shape. Prune coniferous trees only for a definite reason, never just for the sake of pruning. Before you prune try to visualize what will happen if you prune.

Broken Leaders

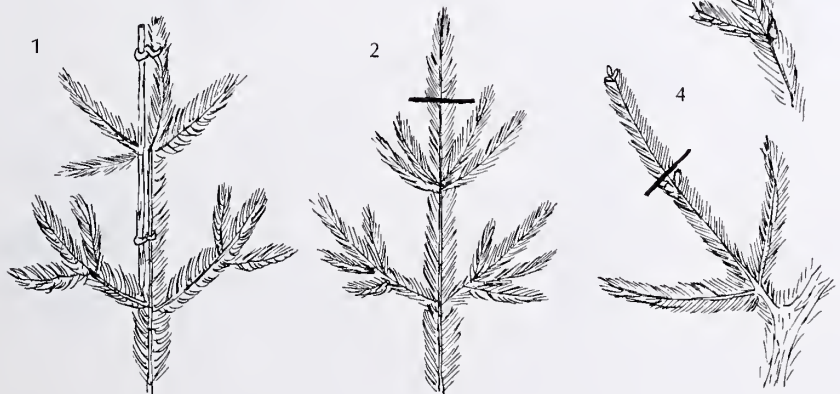
Should a leader be broken, a lateral branch can be trained to become a new leader. The best time to do this is spring when the branches are more flexible and can be bent carefully without breaking. A brace or splint (Fig. 1) is used to hold the new leader in place throughout the following growing season after which the brace should be removed. Strips of a nylon stocking or fabric used in figure-eight fashion make good ties and are to be preferred to twine or wire which may injure the young bark.

Two Types of Coniferous Trees

Firs, Douglas-firs, pines, spruces and a few less-common conifers produce their branches in whorls around the main axis. Given good soil, enough space, light and water, these trees will normally grow into symmetrical conical specimens requiring little pruning. It may happen that a tree is very vigorous and the annual growth of the

leader is long, so long, in fact, that the whorls of lateral shoots are quite far apart, with conspicuous bare spaces between the upper whorls. These open spaces can be reduced by pruning the growing leader to about half its size in the spring during the active growing season (Fig. 2). Do not cut before the new growth is well underway, and do not prune after the new growth is nearly mature, because no new terminal bud can be formed from hardened tissue.

Lateral growth can be checked in a similar way, or one can remove the terminal bud of a side branch (Fig. 3). If even greater size control is needed, one can cut the branches back to an inner bud (Fig. 4). More drastic pruning than this is ill-advised, as these plants are incapable of regenerating from older wood. Pines may be pruned in the "candle stage" when new



Drawings supplied by author

young shoots, with their immature needles packed tightly around the stem, look like candles (Fig. 5). When nipped in half at this stage the annual growth is reduced and buds will be formed at the end of the pruned shoot. Sometimes secondary or even tertiary leaders develop; these should be removed as soon as possible and not left to develop for another growing season (Fig. 6).

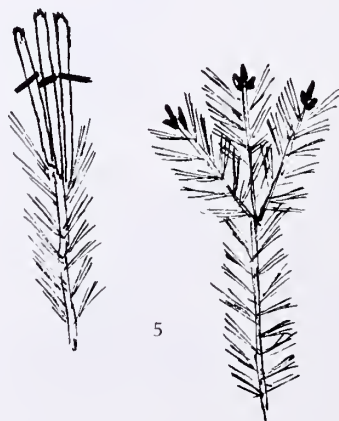
Arborvitae, cedars, cypresses, false-cypresses, giant-sequoia, hemlocks, junipers, redwood and yews are characterized by a less regular pattern with buds and branches not arranged in whorls. Slowing down the growth by pruning can be done more easily than in conifers with a whorled growth pattern. Lateral branches that are too long can be pruned back to within the periphery of the foliage where the cutting point will be hidden, provided the branches still carry sufficient foliage to continue to grow (Fig. 7). Only giant-sequoia and yews may be pruned back more severely, even right back to the trunk if necessary; latent buds will break and give rise to a new crown in a few years.

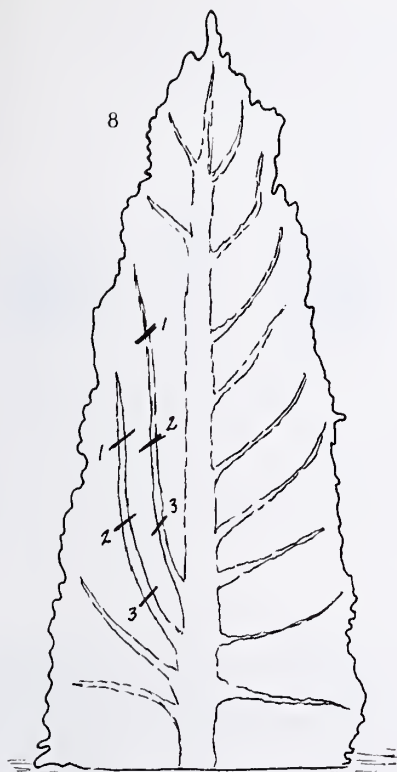
Single trunks also are to be preferred for coniferous trees in this group, but occasionally lateral branches develop into secondary leaders and remain undetected for years. This happens most frequently in arborvitae, false-cypresses and junipers. Visually this is no disaster since the plant as a whole retains its characteristic shape; structurally, however, such a plant is at a

disadvantage, particularly in regions where snow storms and ice storms are frequent and where multistemmed conifers are the first ones to suffer damage. Secondary leaders may be pruned back gradually over a period of several years until only a side branch remains and the gap has been filled in gradually by lateral growth of the surrounding branches (Fig. 8).

Pruning to Correct Problems

Sometimes a Colorado blue spruce or other evergreen trees will grow in an extremely lopsided manner, even without being crowded by other plants or without exposure to prevailing winds (Fig. 9).



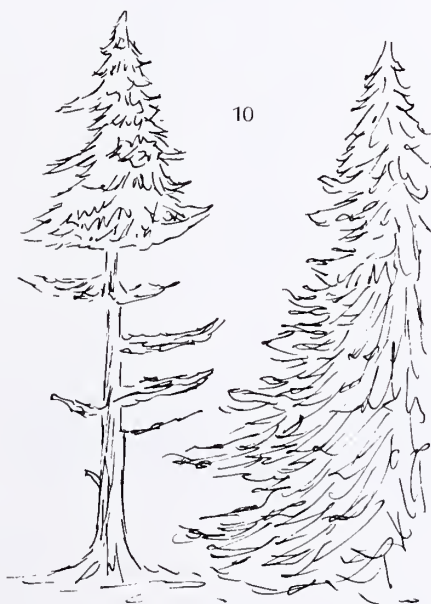


Chances are that the plant is a grafted one and that the scion used in grafting came from a lateral shoot. Such a plant needs to be staked until it gains the desired posture. If one side of the plant produces more vigorous growth than the opposite side it will require some careful pruning (removal of buds, pruning during spring growth or



pruning to an inner bud as discussed earlier) to obtain a symmetrical tree.

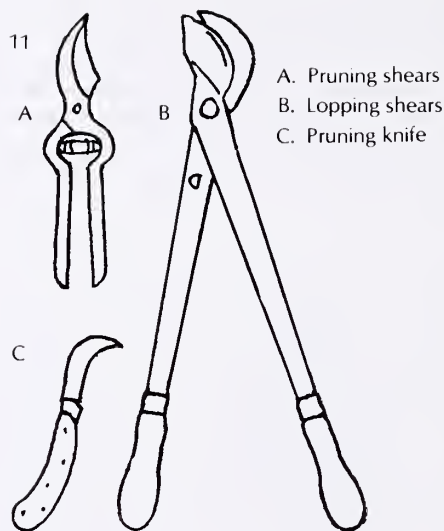
You may be tempted to remove the lower branches of large evergreens if they interfere with mowing the lawn, but you must realize that, once removed, there will be a gap that cannot be filled again by your tree (Fig. 10). Assure that the plant con-



tinues to receive full exposure to light. Do not wait until the lower branches begin to turn brown; once the needles have turned brown there is no chance for recovery. Do not expect three trees to grow to maturity gracefully where there is only space for one.

Tools and Techniques

For all pruning work use the proper tools such as hand pruning shears (secateurs), lopping shears, a pruning saw and a pruning knife (Fig. 11). Be sure the tools are sharp and free of rust; they will be easier to work with and do a better job. Always make clean, smooth cuts without ragged edges. If you use a saw, smooth the surface of the cut with the pruning knife. Do not



A. Pruning shears
B. Lopping shears
C. Pruning knife



Center shows proper pruning

leave any stubs, they will die back. Do not damage buds, cut just beyond (above or outside) a bud (Fig. 12). If you detect or suspect disease, clean tools after each cut. (See p. 22).

If, after the pruning is done, you stand back and, when looking at the tree, you can hardly detect where the tree was pruned, you are looking at a job well done. ✂

Summer Pruning, a Reducing Regime

When plants are dormant, abundant carbohydrates, made while the plant was growing vigorously, are stored in lower plant parts. This food is used by the plant to grow substitute branches for those removed by dormant-season pruning. The weather is usually cooler then, too, so overheating of the pruner is less likely. And, in the case of deciduous plants, it's a lot easier to see what one is doing, or trying to do. So dormant-season pruning is usually recommended. But if you want to hold a plant in place with a minimum of effort, just prune it heavily in early to midsummer (early to mid-July in Ohio).

Watch now—that means “prune,” not “shear.” Remove entirely large branches laden with leaves, shorten others by cutting some back one-third of their length to a side branch, others by doing the same one-half or more. The tree or shrub will soon make a bit of new growth and present a decent, though smaller, appearance. At the same time next year, the plant may or may not be larger than it was when pruned, but it surely won't be as big as if not pruned at all.

Keep pruning through summer as though getting paid by the pound until the plant settles down into the desired groove, then ease up.

Repeated summer pruning can kill a woody plant eventually, so don't get the idea you need not exercise some restraint. ✂

PRUNING DECIDUOUS AND EVERGREEN SHRUBS

Fred K. Buscher

Evergreen shrubs keep their foliage throughout the year. Narrowleaf or needled evergreen shrubs commonly planted in the home landscape are yew, juniper, arborvitae, and false-cypress. Broadleaf evergreens are represented by rhododendron, Japanese pieris, holly, mountain-laurel and mahonia.

Deciduous shrubs are woody plants that drop their leaves in autumn. Examples of deciduous shrubs are lilac, forsythia, most viburnums, cranberry cotoneaster, spirea and mock-orange.

Why Prune

Some yearly pruning is necessary for most evergreen and deciduous shrubs in the home garden. Without some attention most shrubs would soon outgrow the space allotted for them in the landscape. The amount of annual pruning could be minimized if the proper selection of shrubs was based on their functional use and desired height and spread of the shrub when fully grown. Shrubs will grow for indefinite periods with proper care and pruning.

Before you start to prune, know what you wish to accomplish. Pruning is one of the most essential but least understood of the garden maintenance practices. Good pruning is the selective removal of branches without changing the plant's nat-

ural appearance or habit of growth. Shrubs pruned to an artificial shape require more annual pruning to maintain their size and shape. Prune also to improve the health and vigor of a shrub by cutting out dead, diseased, and damaged wood, and to remove old branches to rejuvenate or stimulate new growth.

How to Prune Deciduous Shrubs

The recommended way to prune most deciduous shrubs is "thinning out," gradual renewal, and rejuvenation pruning. In thinning out, a branch or twig is cut off at its point of origin from the parent stem, to a lateral side branch, to a "Y" of a branch junction, or at the ground level. This method of pruning results in a more open plant and does not stimulate excessive new growth. Considerable growth can be cut off without changing the plant's natural appearance or habit of growth. Plants can be maintained at a given height and width for years by thinning out. This method of pruning is best done with hand pruning shears, loppers, or saw, but not hedge shears. Thinning allows room for growth of side branches. Thin out the oldest and tallest stems first.

When thinning back to a side or lateral branch of a deciduous or evergreen shrub, try to select a branch at least one half or



Before thinning



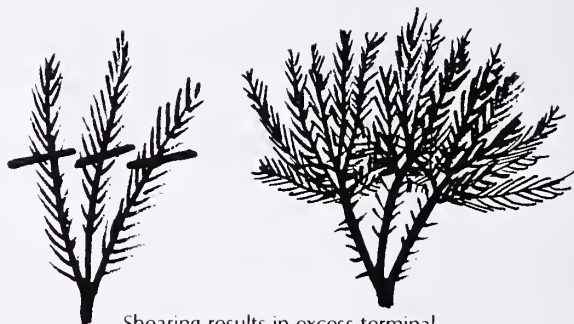
After thinning



Right way



Do not leave stubs



Shearing results in excess terminal twigs and unnatural look

more the diameter of the branch cut off. The lateral branch that remains can then become the terminal growing point for that branch.

In gradual renewal pruning a few of the oldest and tallest branches are removed at or slightly above the ground level on an annual basis. Some thinning-out pruning may be needed to shorten long branches or maintain a symmetrical shape. A healthy mature shrub can be maintained for an indefinite period by this method.

To rejuvenate an old, overgrown shrub one-third of the oldest, tallest branches can be removed at or slightly above the ground level before new growth starts in the spring over a three year period. A more drastic but effective rejuvenation method is to cut

off all the branches at or slightly above the ground level, also in early spring. This will stimulate all new branches to grow from the base of the plant.

Avoid leaving stubs when pruning even a small shoot or twig. Short stubs will not heal over properly and may provide a source of entry for insects and diseases. Cuts too far above a bud may destroy the bud by decay or die-back. Cuts too close to the bud may dry out the bud, especially in winter. The proper pruning cut to a bud should be $\frac{1}{8}$ to $\frac{3}{8}$ of an inch above the bud and slightly slanted away from the bud.

How to Prune Evergreen Shrubs

In the nursery it is a common practice to prune arborvitae, junipers, yews (*Taxus*



Pruned by shearing



Pruned by thinning-out

The general pruning procedure, illustrated below for crape-myrtle, applies to many other large shrubs and small trees of similar structure

**Proper Method of
Pruning Crape-myrtle**



This plant, pictured before pruning, needs to have all weak and dead stems removed.



Same shrub after removal of weak and interfering wood, also base sucker growth.



Results of proper pruning: graceful, vigorous growth with distinctive shape.

**Improper Method of
Pruning Crape-myrtle**



Cutting at the dotted line is the usual course taken by those who "prune" shrubs.



The same plant after bad pruning, as indicated above. The sucker growth remains.



Result: the lovely natural shape of the shrub is lost, and bloom will be sparse.

spp.), and other evergreens into tightly shaped plants with hedge shears. This method is not recommended in landscape maintenance unless a formal hedge is desired. Evergreen hedges and screens sheared to retain a formal appearance may be pruned in early spring and again in the summer.

If shrubs such as junipers and yews are pruned with hedge shears, much new growth will arise from the cut stubs. Plants pruned only by this method will actually gain in height and spread each year, and may out-grow their space in the landscape. These evergreens lose their natural softness and resemble grotesquely rigid green cones, balls, boxes, and cylinders. When shearing is necessary, it should be done before new growth in the spring. The new growth that follows will help prevent a severe unnatural plant shape.

The "thinning-out" method of pruning, as described above for deciduous shrubs, is recommended for most narrow and broadleaf evergreen shrubs.

Time to Prune

The ideal time to prune most shrubs, except spring blooming shrubs, is during the dormant season prior to the start of new growth. Shrubs that bloom in spring may be pruned after flowering. Late flowering shrubs that bloom on wood produced that same year can be pruned before growth starts in the spring.

The year-long effect of the shrub's branching characteristics can be more important than its flowering effect in the landscape. Therefore, it may be better to prune

all flowering shrubs in early spring before new growth starts, even though some bloom will be sacrificed by this method.

Yews may be pruned almost any time with good results. However, the best time is just before new growth starts in the spring. A second flush of growth occurs in late summer. Light pruning may be done in July to shorten long growth and retain the plant's natural form. If heavy pruning is delayed until summer, the dormant buds already present may not grow until spring when they will begin to grow below the pruning cut. Junipers may be pruned almost any time with success, but more compact plants of higher quality are achieved when pruned in late winter or early spring and again in July. Dwarf, slow growing types require little pruning, although faster growing, spreading forms need extensive pruning to retain a compact, symmetrical form.

Pruning Tools

Pruning shears are for branches up to $\frac{1}{2}$ or, at most, $\frac{3}{4}$ inches in diameter. Twisting shears to cut larger branches will strain and weaken them and produce a ragged cut. The anvil-type of pruning shears is satisfactory for close-cut precision pruning. *Lopping shears* have long handles and are designed to cut larger branches $\frac{3}{4}$ to 2 inches in diameter. *Pruning saws* have coarse teeth designed to cut on the pull stroke and are useful to prune larger shrubs. *Hedge shears* are used for shearing hedges or formally shaped plants. Avoid using hedge shears for other pruning purposes. ❧

Rejuvenation Pruning Follow-Up

For rejuvenation purposes always cut a large shrub to the ground in early spring before growth starts. A shrub cut back to the ground in summer loses a tremendous percentage of its food reserves and will come back lamely, or not at all.

Shrubs cut back drastically in early spring send up vigorous shoots, usually unbranched. If untended, the resulting shrub may be little better than it was before. To obtain better form, trim again in late spring while growth is still succulent (last part of June in latitude of Des Moines and Boston). Remove weak shoots that obviously won't compete well and nip tops of vigorous canes to halt terminal growth and promote branching. Practice artistry—cut shoots to varying heights to provide a natural effect. ❧



Canada hemlock is one of the best of all evergreen hedges.
One pruning in mid-summer promotes lacy growth by autumn.

PRUNING HEDGES

John Vogt Masengarb

Hedges consist of plants set in a row so as to merge into a solid linear mass. They have served gardeners for centuries as screens, fences, walls and edgings.

An admirably well-shaped hedge is no accident. It must be trained from the beginning. The establishment of a deciduous hedge begins with the selection of nursery stock. Choose young trees or shrubs one to two feet high, preferably multiple-stemmed. Then, when planting, cut the plants back to six or eight inches. This will induce low branching. Late in the first season or before bud-break in the next, prune off half of the new growth. In the following year, again trim off half.

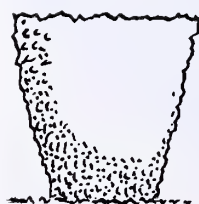
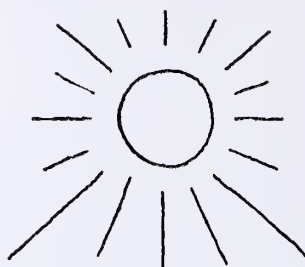
In the third year, start shaping. Trim to the desired shape before the hedge grows to the desired size. Never allow the plants to grow untrimmed to the final height before shearing. By that time it will be too late to get maximum branching at the base. The lower branches must not be allowed to be shaded out. After the hedge has reached the dimensions desired, trim close in order to keep it within those chosen bounds.

Evergreen nursery stock for hedging need not be as small as deciduous material. Furthermore, it should not be cut back when planted. Trim lightly after a year or two. Start shaping as the individual plants

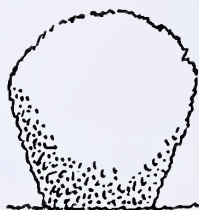
SHAPING

POOR

GOOD



Narrow bottoms get too much shade



Narrow tops allow fuller distribution of sunlight



Snow accumulates on broad flat tops



Straight lines require more frequent trimming



Peaked and rounded tops hinder snow accumulation



Rounded forms, which follow nature's tendency, require less trimming

merge into a continuous hedge. Do not trim too closely because many needle-bearing evergreens do not easily generate new growth from old wood.

Shaping

Hedges are often shaped with flat tops and vertical sides. This unnatural shaping is seldom successful. The best shape (as far as the plant is concerned) is a more natural form—rounded or slightly pointed top with sides slanting to a wider base. After plants have been pruned initially to induce low branching, the low branching will be maintained by trimming the top narrower than the bottom, so that sunlight can reach all of the leaves on the plant. Rounded or

peaked tops aid in the shedding of snow, which if left, may break down the hedge. Before shaping, some thought should be given to the shape of the untrimmed plant. Then that should be modified and formalized. For example, naturally conical arbovitae does particularly well in a Gothic-arch shape. Common buckthorn, a spreading plant, is more easily shaped to a Roman arch.

These questions often arise: "How often should this hedge be trimmed?" and "When should I trim?" Answers depend to some extent on how formal an appearance is desired. One may wish a front yard hedge to be neat and tidy while preferring a back yard one on the shaggy side. But,

in general, trim before the growth exceeds one foot. Hedges of slow-growing plants such as boxwood need trimming sooner. Excessive untrimmed growth will kill leaves beneath, and also pull the hedge out of shape. This is especially true with weak-stemmed shrubs such as ninebark. Around Chicago, yews and other evergreens may need shearing only once annually and then not before July; in milder areas two or even three shearings may be necessary. Deciduous material should be trimmed earlier than July, but after the spring flush of new growth, and often will need to be trimmed once or twice more. Frequency depends on the kind of shrub, season, and degree of neatness desired.

But what does one do if he or she inherits a large, overgrown, bare-bottomed and misshapen hedge? If it is deciduous, the answer is fairly simple. In the spring, before leaves appear, prune to one foot high, or at least one foot below the desired height. Then trim carefully for the next few years to give it the shape and fullness desired. Occasionally the hedge plants may have declined too much to recover from this treatment and replacing them may be necessary.

Rejuvenating evergreen hedges is more difficult. As a rule, evergreens cannot stand the severe pruning described above.

Arborvitae and yew are exceptions. Other evergreen hedges may have to be replaced.

Tools

What tools should be used to trim hedges? The traditional pair of scissor-action hedge shears is still the best all-around tool. It will cut much better and closer than electric trimmers which often break and tear twigs. Hand shears can be used on any type of hedge, while electric trimmers do poorly on large-leaved and wiry-twigged varieties, and sometimes jam on thick twigs. Hand shears are also quieter and safer, less likely to gouge the hedge or harm the operator.

Hand pruners will be useful in removing a few stray branches, and are essential if an informal look is desired. Large individual branches can be removed with loppers and/or a pruning saw. Chain saws are not recommended for use on hedges.

The formal shaping of trees and shrubs into garden hedges is a manifestation of the philosophical ideal of human mastery over nature. Therefore, trimming a hedge need not be viewed as mere drudgery. Rather, it can be seen as a creative act. To take an overgrown hedge and reduce it to a neat, precise geometrical shape can bring a sense of satisfaction akin to that felt by a sculptor. ❀

Trees From Seedlings

Trees from seed are fun. Maybe you planted a walnut last fall and squirrels overlooked it. Or a freelance maple popped up in the lily bed. You have your own baby tree.

But trees from seed are often unruly, growing awkwardly and quite unlike trees pictured in mail-order catalogs.

Try the old nursery practice of growing the seedling any which-way for two or three years until the base of the trunk is an inch or so in diameter. Then on a nice spring day before leaves appear, with lopping shears or pruning saw and raw courage, cut the tree off about an inch above the crown. That's right, cut it off, all of it.

Sprouts will, without doubt, burst from the stump. While they're still small, 6 to 12 inches high, choose a sturdy one that emerges vertically from the stump, forming a smooth joint. Remove the others; if they don't snap cleanly with the fingers, cut them at point of origin with a sharp knife.

Your adopted shoot will need a stake that stands about four feet out of the soil and it must be secured to the stake periodically with cloth strips as it grows. Loosen ties as necessary. Mulch it a lot, fertilize it a little, water as needed.

You'll be amazed. Remove the stake next spring and, if you have two such trees, look for the hammock. ❀

PRUNING FRUIT TREES

The Fundamentals of Training Young Trees and Controlling the Yield and Vitality of Mature Trees

Leo G. Klein

The framework, health, and fruit-bearing capacity of all kinds of tree fruits is determined by the pruning done to young trees within two years after planting. Within this time, the selection of good framework branches should be completed. If wide-angled (35° to 60°), well spaced branches are saved and all others pruned away while still small, future pruning becomes a relatively simple operation. On the other hand, improperly trained trees will not carry a heavy load of fruit, and major breakages often occur just when the tree reaches the age of maximum production.

The central-leader type of tree with a strong leader and four lateral branches, spaced 6 to 8 inches apart along the trunk, facing in different directions, and forming wide angles (35° to 60°) with the leader or trunk, is the ideal type of framework which will insure the maximum strength coupled with a good fruiting area at maturity. The lowest branch should not be closer than 20 inches to the ground for upright types, while naturally lower-growing varieties or species should be headed somewhat higher with the lowest branch located 2 to 3 feet from the ground.

Most apple, cherry and plum varieties lend themselves nicely to this type of training, while minor modifications are usually necessary for most pear and apple varieties which have an upright growth habit. In such cases, the trees usually are trained to a modified central leader type in which the central leader is headed back two to three years after planting. This is done to encourage the growth of lateral branches and thus keep the fruiting area somewhat lower. Peaches and Japanese plums are difficult to keep to a central leader type, but even with them a stronger tree will result if its early training is of this type.

The open-center type of tree, so common in many old orchards, has serious defects, particularly the crowding of the

main branches which all arise from approximately the same area of the trunk. This makes for weak, narrow crotches which are very subject to breakage under a load of fruit.

Pruning Young Trees

The principle that pruning young trees delays bearing should always be uppermost in one's mind. After the framework has been established, only very limited correctional pruning should be done until the tree begins to bear. Young trees which appear to be too upright in habit will naturally become more spreading due to the effects of carrying their first few crops of fruit. Hence the urge to thin out crowding branches in non-fruiting trees should be suppressed until after the trees have borne a crop of fruit. However, during this early non-fruiting stage some lateral pruning may be necessary in order to keep the central leader slightly higher than the laterals. While this may be done by cutting back the laterals, it is better to remove smaller secondary laterals from the main lateral branches. Laterals from main limbs which arise within 18 inches of the main trunk should also be removed annually during this period because they are not likely to become permanent branches.

Pruning Bearing Trees

Moderation should be the keynote in pruning bearing trees. Weak, shaded branches which are usually found in the lower and inner portions of the tree should be removed as such wood produces only poorly colored, poor quality, small sized fruit. The removal of vigorous, productive branches in order to permit light to enter the center of the tree is not usually a profitable practice.

Peaches, which bear on one-year-old wood, require heavier pruning than apples and pears, whose fruit is borne mostly on



Central Leader Method of Training Fruit Trees

Top left. This 3-year-old apple tree has good, wide crotch angles, branch spacing

Top right. This peach tree has well-arranged branches which can carry a heavy crop

Right. Open-centered peach tree, improperly trained in the beginning, has bad crotches and is already splitting apart



spurs which are productive for several years. However, even with peaches, very heavy pruning will reduce yields and the commonly practiced, heavy heading-back of bearing peach trees should be avoided because the slight gain in fruit size and easier picking is insufficient compensation for the resultant decrease in total yield. While it is true that heavy pruning keeps the trees vigorous, the same result can be obtained, without reducing yields, through better soil management practices which

maintain a higher level of soil fertility and moisture, making it possible for the soil to support a larger, more productive tree. Heavy pruning with these tree fruits is hardly ever justified except on very old trees or trees which have been planted too closely, or where trees have been planted on shallow soils which will not support a large tree.

Very old trees which no longer respond satisfactorily to good soil fertility and management practices may require heavy



Eight-year-old dwarf apple before pruning.



Branches were shortened during pruning.

pruning, and once this has been resorted to it should be done annually and the cuts should be well distributed throughout the tree.

Time of Pruning

In colder regions, pruning is best done in late winter or early spring while the trees are still dormant. November and December pruning should always be avoided in cold areas as severe tree injury may follow such a practice. The hardier species, such as apples and pears, usually are pruned first while peaches, apricots and sweet cherries are not pruned until March, when

the danger of severe freezing is past.

Pruning Tools

Although power pruning equipment is now standard in most commercial orchards, the small grower or home gardener can do an excellent pruning job with relatively simple tools. A good pair of shears and a good pruning saw are the two basic hand tools required, and will accomplish most of the pruning on all but very large trees. A pair of loppers and a pole pruner are also essential equipment for commercial orchards, and often for the amateur. ❀

Pruning after Winter Damage

If a woody plant suffers winter damage year after year, perhaps you should remove it. If you don't, sooner or later a particularly hard winter will exterminate it.

Most plants in a given area will be fine in normal years, but some may suffer from an unusually severe winter that may occur every twenty to thirty years. When it happens, dead wood must be removed according to good pruning practices (described elsewhere in this Handbook). But don't be in a hurry! Seemingly dead tissue may give rise to new growth if given time. It's not unusual for it to happen as late as July, so wait . . . give your shrub a generous chance. After new growth appears, the extent of necessary pruning is easily ascertained. Work carefully to avoid breaking tender new shoots. ❀

A METHOD OF PRUNING APPLE TREES

Don R. Heinicke

A good system for pruning apple trees for restrained size, pleasing appearance, and maximum production can be called the "head* and spread" method for central leader trees. It is well suited for standard trees as well as for trees dwarfed by either rootstock** or spur-type scion varieties (genetic dwarfs). The general idea is to maintain the tree so there is always a 1-year-old section at the top of the tree that is treated the same regardless of the age of the rest of the tree (see Figure 1). Next are 2-year-old, 3-year-old, 4-year-old, and older sections, or layers. Each is handled differently.

This pattern continues until the desired tree height is reached. At that time, the 1-year-old section is maintained by cutting back each year, so the 1-year-old section is followed by older sections as the 2-year-old section becomes increasingly older, as do all lower sections. Each of these sections will be maintained smaller than the one below it in order to preserve the pyramidal shape.

Planting Time

At planting time the tree should be headed and the side branches removed to improve the balance between the root and top. This helps to force strong branches where desired. The lower the tree is headed the greater the strength of the developing shoots. If trees are headed too high, the initial branching will occur rather high, and it will be difficult to develop lower branches. Heading should be 10 to 12 inches above the desired height of the lowest lateral branch. A good height for that lowest branch is about 18 inches. To ac-

complish this, head the tree at about 18 to 30 inches. Heading the tree this severely encourages the development of many strong side shoots. As a result wide crotch angles develop, and a good selection of side branches can be made.

First Season

During the first growing season, remove all shoots developing below 18 inches on the main trunk. Select a central leader and 3 to 5 permanent lateral branches and remove all others. Do this when shoots are about 6 inches long to avoid removal of too much leaf area. At the end of the first year, just before growth begins for the second season, the tree has a 2-year-old section (the original whip that was planted) and a new 1-year-old shoot.

Second Season

Leave only the one best vigorous terminal shoot to form the new 1-year-old section, removing less desirable shoots when 3 to 6 inches long. More than one shoot may develop at the end of each cut-back lateral; treat these the same, saving the best one and removing the rest. Select lateral branches on the 2-year-old section (last year's 1-year-old) with a spacing of 18 to 30 inches above those below. This seems a great distance on a young tree but is ideal as the section ages. Such distance requirement means that very few branches will be selected in the 2-year-old section. In the second season, branch spreading should begin in the 3-year-old section (see "Branch Spreading" below).

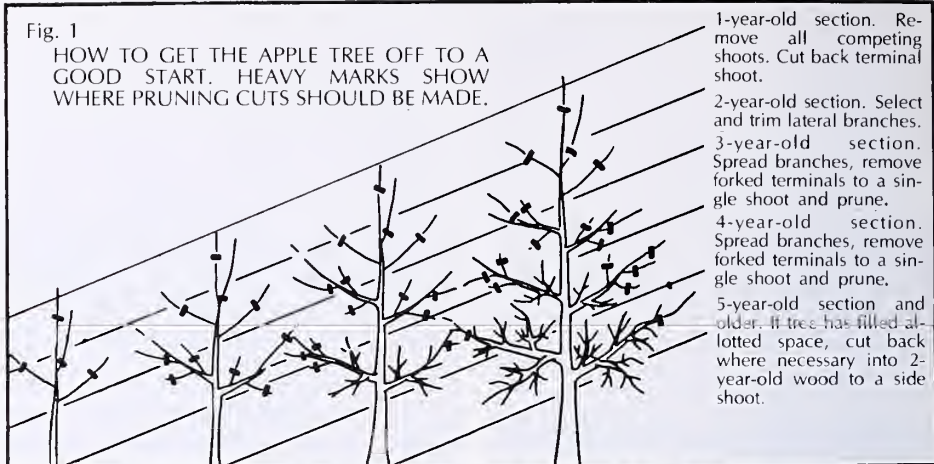
Remove all excess or out of place 1-year-old shoots in the 3-year-old section and then prune each 3-year-old lateral shoot as if it were a separate central-leader tree. Remove all shoots that compete with the terminal shoot; prune to develop side branches originating from the sides rather than top or bottom of the lateral branch;

*cut back

**Dwarf varieties are often produced by grafting a standard variety onto a rootstock that inhibits full growth of the scion. Such trees often have widely spaced, weak root systems, necessitating mechanical support.

Fig. 1

HOW TO GET THE APPLE TREE OFF TO A GOOD START. HEAVY MARKS SHOW WHERE PRUNING CUTS SHOULD BE MADE.



cut back about one-fourth of the new growth at the end of the lateral. Don't remove spurs (short stumpy shoots with crowded nodes) because flowers and fruit arise from them.

Third Season

Remove suckers (vigorous upright shoots) from trunk and/or limbs that were spread. Do so during the summer as they develop. Prune 1-, 2-, and 3-year-old sections as previously described. In the 4-year-old section, thin out by removing crowded branches, those crossing others, and those growing laterally into areas that obviously need no more shoots.

Fourth and Subsequent Seasons

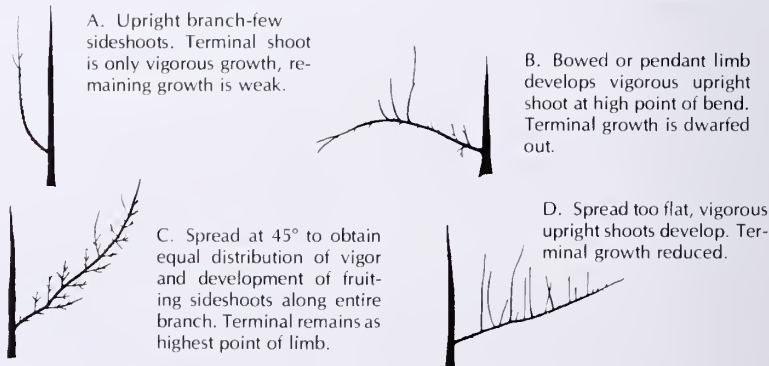
Fruiting should begin this season. Follow same procedures as before, pruning as lit-

tle as possible in older sections. Develop a good set of lower branches before allowing the tree to become too tall. If top becomes too dominant, cut it out, even if it requires a rather large cut into older wood. A new terminal shoot will develop rapidly, and the initial training process starts over again on the 1-year-old shoot.

Branch Spreading

Limb position is essential to the development and maintenance of fruiting branches. How and when it is done determines its success. Limbs can be moved out of the upright position by using spreaders or braces, by tying limbs down, or by letting the weight of the fruit pull down the branches. Wooden spreaders with sharp pointed nails in each end are most commonly used. These can be used in sizes from 1 to 4 feet. Where shorter spreaders

Fig. 2



are needed, sharpened wires or welding rods work well. The central leader provides a base against which the limbs can be spread. Tie downs can be used where branches have become too long for the use of spreaders or where wind makes it desirable. Spreaders or ties should be removed after 2 or 3 months, and replaced if necessary.

Spreading can be done at any time of year but is best done during the dormant season in conjunction with pruning. Often limbs which are much too crowded can be saved by simply spreading them apart horizontally as well as vertically before pruning. Initial spreading usually takes place when the limbs to be spread are 2 or 3 years old. The limbs should be spread to about a 45° angle from the central leader. When limbs are spread below 45° early in the life of the tree, undesirable strong shoot growth often develops from the upper surface of the limb.

When spreading, the tip of the branch should be maintained as the highest point

on that branch. If the tip is pulled down forming a bow in the limb, a vigorous shoot will develop from the high point of the bow, dwarfing out the terminal shoot. Branches should be spread carefully to avoid splitting them away from the central leader. The smaller the branch and the wider its angle of attachment, the less danger there is of splitting the branch. Always hold or support the branch near its point of attachment. Make a rather sharp bend in the branch. This sharp bend acts as a mild form of scoring that aids in bringing the branch into a fruitful condition. (Figure 2 shows branch angles discussed above.)

High Production, Low Maintenance

The heading cuts and spreading used in this system develop a tree with a rigid framework of fruiting branches. The bearing tree developed in this manner requires only a minimum of maintenance pruning. The results should be a highly productive tree, easily maintained, and producing high quality fruit. ❧

Pruning Overgrown, Neglected Fruit Trees

If fruit trees are left without pruning, even for only a few years, they develop unbelievable tangles of growth and yield small crops of inferior fruit. It's best to attack, and that's the word, such trees in spring before leaves appear.

Sooner or later, all upright branches (except a strong central leader, which may or may not exist), and all damaged and all dead branches must go. Also, if a pair of branches cross or rub, or if a pair of branches are parallel and closer than 18 inches apart, one must go. However, if there's a lot of those "must go" branches, it's better to remove only half the first year, the rest the next. In extreme cases, go with thirds and take three years.

If the tree is absolutely too tall, cut it back, but do it three or four feet per year, cutting back to lateral branches, until the desired height is reached or it seems too drastic to cut more. Open the center of the tree to sunlight by removing the mass of thin branches arising from trunk and larger branches.

The framework branches, left after all the above surgery, usually need shortening, with lower branches left longer than upper ones to achieve a rounded conical shape.

Stand back for a look. If parts of the tree are still dense, remove another branch. If a "hole" exists, wait for growth to develop in a year or two, then cut away all but the new branch most likely to fill the gap. After that, each year shorten new growth about one-third, remove suckers and weak growth and damaged wood.

Note: Backyard fruit production isn't for everyone. If you can do all necessary pruning and spraying yourself and enjoy doing it, that's great. But if you have to pay for the pruning and then bear the expense of pest control . . . maybe you should consider how much fruit all those dollars would purchase at your favorite market. ❧

PRUNING GRAPE VINES, BRAMBLES AND BUSH FRUITS

John P. Tomkins

Pruning, to many home gardeners, seems to be one of the most puzzling and difficult of cultural practices in fruit growing. If certain basic principles are kept in mind, however, it is possible for even inexperienced growers to do a satisfactory job. The purpose of pruning is to regulate the growth of the plant so it will have maximum strength for carrying a good crop of fruit while making adequate vegetative growth for good yields in subsequent years. Grapes are pruned severely by removing ninety to ninety-five percent of the previous season's growth. Brambles may have forty to sixty percent of the previous season's growth removed while blueberries, currants and gooseberries are lightly pruned. The ideal time to prune these fruit plants is in late winter after the cold weather is gone and before growth starts in the spring. Bleeding in the spring after pruning is not harmful to the plant.

Pruning Grapes to the Four-arm Kniffen System

The Kniffen system of grape culture requires a trellis, which often is in the form of two or three wires stretched tightly between posts. Sturdy wire, No. 9 or No. 10, is best. The lower wire should be 3 feet or a little less above ground, the top one at about 5 feet.

Young grape vines are pruned to the best single cane either at the time of planting or shortly thereafter. After the buds have started to grow, remove the topmost bud, leave the next two buds, and remove all other buds. Make a tight tie with string just below the topmost node where the bud was removed, and secure this cane either to the bottom wire of the trellis or to a stake. Go through the planting and remove all clusters of flower buds before they bloom and remove all water sprouts, leaving only shoots developing from the two buds left to develop the framework of the vine. It

may be necessary to tie these shoots to the trellis several times during the first year to prevent strong winds from breaking them.

The second year, select the better cane of the previous year's two shoots and prune it to four or six buds. If convenient, leave two buds at the bottom wire and three at the top wire. Tie the cane vertically to the trellis. When the flower clusters are visible, remove them so the vine does not fruit. When the new shoots are 18 to 30 inches long, tie them to the trellis to prevent wind breakage. All water sprouts (shoots not wanted) arising along the trunk should be removed by breaking them where they attach to the trunk.

The third year, leave 12 to 25 buds and allow them to bear one cluster per shoot. Leave short canes of three to five buds long along each wire on opposite sides of the trunk. These short canes will form the arms on which the spurs and fruiting canes of future years will form. If the vines are very small in the third year, prune as for the second year and wait until the fourth year for a small crop.

When grapes are trained to the four-arm Kniffen system, the shoots arising from buds at the terminal nodes on the canes (furthest from the trunk) make the best vegetative growth. It is desirable to select canes for fruiting within 12 inches of the trunk. A spur (two-bud cane) is left at each arm between the fruiting cane and the trunk to insure development of a desirable shoot that can be used for fruiting in subsequent years.

Pruning Mature Grape Vines

'Concord' and many other American grape cultivars are pruned at a scale of "30+10 buds" while the French hybrids are pruned at a scale of "15+10 buds." This scale indicates that in pruning 'Concord', one should leave 30 buds on the vine for the first pound of pruning and 10 additional



Above, grapevine trained to the Kniffen four-arm system. Lateral branches and trunk are tied to heavy wire. Below, after pruning only the four strongest lateral branches are retained. Flower buds and fruits will be borne on new shoots growing from buds on these remaining branches.



buds for each pound above the one-pound level. The same results can be attained in metric weights by leaving 31 buds for the first 500 grams of prunings, with one additional bud for each 50-gram increment in weight of pruning above the 500-gram level. (The weight of prunings refers to the weight of the previous season's vegetative growth weighed at the time of pruning. Do not weigh sections of the trunk, arms, or any wood older than one year.

Grape buds vary greatly in fruitfulness. The most productive buds occur on the top of the trellis where the shoots were best exposed to the sunlight during the previous season. These canes have an internode diameter of $\frac{1}{4}$ inch or more, an internode length of 6 inches, and a chocolate-brown bark which is firmly attached to plump wood. Canes of smaller diameter with very long internodes or those with poorly colored bark are less productive and should be avoided, if possible.

Pruning Neglected Grape Vines

The grape has a long productive life, and old neglected vines can be renewed. In the first year of rejuvenation, limit the vine to a few new canes originating as close to the trunk as possible, and remove all fruit clusters. Retain a vigorous sprout growing from the root or at a low level on the trunk, and tie it to the wires of the trellis to form a new trunk. This sprout is handled like a young vine, and after several years the old trunk can be removed. A vine that fails to send up a sprout may be cut off at the ground level to force such growth, but this technique sacrifices immediate fruit production.

Grapevines may be grown on arbors, porches and elsewhere to furnish shade as well as fruit. The same principles of pruning are followed, although the method of training must be modified. The primary difference is the amount of wood left, the number of buds retained, and the distribution of the fruiting canes. The trunk is allowed to grow longer, high enough for the foliage to supply shade. Short, permanent lateral arms originating from the trunk are trained so that the foliage will cover the arbor to the best advantage. More fruiting canes and spurs (and consequently more buds) may be kept than

would be desirable on a vine confined to less space. Arbor vines in a favorable environment eventually develop a larger root system and trunk and therefore more capacity. For best results, arbor vines should receive annual renewal pruning.

Pruning Blueberries

A blueberry bush left unpruned, even under ideal conditions, will usually overbear, produce small fruit, and make little or no strong new wood for the next year's crop. A young plant needs very little pruning until it is five to seven years old; thereafter, a small amount of annual pruning is desirable.

The blueberry is somewhat like the peach in its fruiting habit, producing a large number of fruiting buds on new terminal shoot growth. Thus, when pruning, keep two goals in mind: to adjust the fruit crop to the capacity of the bush and root system, and to stimulate strong vigorous shoot growth for the next year's crop.

Prune blueberries during the dormant season, preferably in late March when the hazard of cold weather has passed. Usually from six to nine main stems or branches are left per plant. Cut off the terminal one-third of the vigorous new shoots, and remove all of the weak, twiggy branches. Vigorous fruiting wood must be thinned to a ratio of approximately one fruit bud to three inches of shoot growth.

Pruning Currants, Gooseberries and Elderberries

Currants and gooseberries require little pruning for the first three or four years. The pruning of these fruits is governed by the fact that the two- and three-year-old wood is the most fruitful. Branches older than four years are removed during pruning, as are weak branches and branches close to others. A mature currant or gooseberry bush should consist of approximately 12 branches with nearly equal numbers of one-, two-, three-, and four-year-old branches.

Each year, elderberries send up a number of new canes which attain full height in one season. The flower clusters are borne terminally on the wood of the current season's growth. The most fruitful branches are those in their sec-



Currants pruned to twelve branches of varying maturity bear an optimum amount of fruit.

ond year with numerous lateral branches.

Prune elderberries during the dormant season, cutting off all dead, broken or weak branches at ground level. An equal number of one-, two-, and three-year-old branches should be left, and all branches four years old or older should be removed.

Pruning Bramble Fruits: Raspberry and Blackberry

Brambles produce biennial canes—that is, the canes grow vegetatively the first year, fruit the second, then die. The fruiting two-year-old canes should be removed right after harvest because they tend to spread diseases and insects to the new canes. Cut off the old canes close to the ground and remove them from the planting.

Summer pinching is an effective way to control new shoots of black raspberry,

purple raspberry, and blackberry. Pinching is usually done in June when the new shoots reach the following heights: black raspberries, 18–20 inches; purple raspberries, 24 inches; and blackberries, 36–40 inches. Remove 2–3 inches of the shoot tip. It may be necessary to go through the planting two or three times, as not all shoots will be tall enough for pinching at the same date. When the tip of the shoot is pinched (removed), terminal growth stops, but the three to five buds below the pinched area develop vigorous lateral growth. Plants treated in this way are lower, self-supporting, and seldom require trellising or other support.

New shoots of the red raspberry should not be summer-pinched because the laterals forced by this treatment are more susceptible to winter injury.



Red raspberries pruned with canes secured to a vertical two-wire trellis.

The black raspberry, purple raspberry, and blackberry are pruned in late March by first removing all old canes that have fruited. Second, remove all damaged or weak canes, and shorten the laterals of the remaining canes as follows: black raspberries to 7 inches, purple raspberries to 10–12 inches, and blackberries to 20–25 inches.

The purple raspberry, a hybrid obtained by crossing the black raspberry with the red raspberry, shows some traits of both parents. Recently, some growers have preferred to grow it with cultural treatments similar to those of the red raspberry. With no summer pinching, canes are tall and unbranched and require support to keep the fruiting canes from bending to the ground under the weight of foliage, fruit, rain, snow and wind.

Pruning the red raspberry varies with the system of culture. Because red raspberries produce many suckers from the roots, they are commonly grown in a hedgerow about 12 inches wide. The shoots arising outside of this hedgerow are removed during the summer by cultivation or mowing to prevent a thicket of short, weak, and unproductive canes from developing. During the dormant season, canes that fruited the previous year and all weak or damaged canes are removed. Usually, 10 to 15 of the more robust canes per 3 feet of row are left for

fruiting, and all other canes are removed. The canes left for fruiting are pruned (topped) at a height of 40–50 inches so that they will stand upright when loaded with foliage and fruit. The height of this pruning will vary with cultivar and soil condition. The disadvantages of this system are: (1) a heavy and dense canopy of foliage develops which is susceptible to fungal diseases; (2) the top third of the raspberry cane is the most productive, and this section is removed by pruning; and (3) during periods of heavy rain and wind, the foliage and fruit are likely to lie on the ground.

The red raspberry will produce better berries, be more productive, and may require less spraying for disease control if trained to a vertical trellis with a relatively narrow wall of foliage. Space the posts 25 feet apart, and attach wires of 10 to 13 mil thickness to the posts at heights of 3 feet and 6 feet, depending on the vigor of the plants and the height of the fruiting canes. Some growers prefer a horizontal trellis consisting of cross-arms approximately 12 inches long. The cross-arms are attached horizontally to the posts about 3 feet high, and two wires are secured at the ends of the cross-arms. The new canes grow up between the wires, which support the fruiting canes with a minimum of tying.

Of the two groups of red raspberries, summer-bearing have only a summer crop on canes produced the previous year. Fall-bearing ("ever-bearing") raspberries have a fall crop on the tips of new canes as well as a summer crop on the basal two-thirds of the one-year-old canes. 'Heritage' is the most promising cultivar of this group.

Much current interest lies in growing 'Heritage' for only the fall crop. The canes are pruned to the ground either after leaf fall in late autumn or before growth starts in late April. This procedure eliminates the need for a trellis, the hazard of winter injury, the harmful effects of a disease called spur blight, and the need for costly and time-consuming pruning. It also reduces overwintering insects. Early in the spring, the row middles are cultivated and suckers are allowed to develop in a hedgerow approximately 2 feet wide. They start to bloom in late July, producing a fall crop about August 15 on Long Island. Farther north, fruiting is later. ❀

PRUNING IN THE DESERT

Nicole Holler

Pruning can carefully direct and encourage plants of many forms to realize their full potential. This holds true for desert pruning as well, but there also exist some special variations and considerations.

Desert-tolerant trees and shrubs have a very special, sometimes subtle, beauty; their natural form and shape should be protected and encouraged. A tree or large shrub can be strengthened and directed without altering its natural form by removing, pinching or cutting back weak or spindly growth, and by removing that which is crossing or otherwise undesirable. In most cases pruning should be kept to a minimum. Drastic pruning may expose tender bark to the intense desert sun. Light, frequent pruning allows maximum shading to avoid sunburn.

Many desert-tolerant plants, including *Cassia* and *Leucophyllum*, grow fairly quickly and may become rangy or overgrown, requiring more vigorous pruning.

Some shrubs also lend themselves well for hedges and screening, so the natural form may not be desired in all cases. Basic principles for pruning apply here.

Pruning cacti and other succulents which are commonly grown in desert areas is seldom necessary. The unique forms of these plants should be allowed to develop undisturbed unless damage must be corrected or growth modified because of space limitations. The best time to prune cacti is during seasons of active growth, spring through summer. Cuts should be made with a clean, sharp knife; large woody specimens may require a small saw. The stem should not be crushed in making the cut.

Cacti which form marked joints, such as chollas and prickly-pears (*Opuntia* spp.), should be cut at a joint. Unjointed, cylindrical forms like *Myrtillocactus* and *Cereus* can be cut at a branch union, or where the stem is most constricted.



Cassia artemisioides may need heavy pruning to keep it within bounds.

Many cacti start easily from cuttings. A dusting of fungicide is a wise precaution. The cut must be allowed to dry and form callus tissue several weeks before replanting. Plant cuttings in a well drained medium and do not water until roots form; normal care can then resume.

Some cacti may rot at the base; if this occurs on cylindriform types, a cut may be made in healthy tissue well above the damaged area and the top portion usually can be rooted after the cut dries and calluses. If the stem of a cylindriform species is large, as for example a barrel cactus (*Ferocactus* spp.) above a rotted base, cut so the interior of the stem is longer than the edges, because shrinkage of the interior tissue will occur as it dries.

Small unbranched cacti will need no pruning unless they are diseased or damaged. Make the cut through the stem, again into clean tissue, at the most constricted area. If small plants produce branches or offsets, these can be detached to start new specimens.

Agave, *Yucca*, *Dasyliirion* and other members of the Agavaceae (Century Plant Family) require little pruning. Offsets can be removed to decrease bushiness or to propagate new specimens. Old dry leaves can be cut off at the stem union. The prac-

tice of snipping off tips, although it creates an aesthetically less pleasing plant, may be advisable in some high traffic areas where some of the stout apical spines may be dangerous. Old dry flower stalks can also be removed. Century plants die after blooming. However, starting a new plant is easy from offsets or bulbils.

If a single-trunk or less-branched form is desired tree-like yuccas can have some side branches removed. Damaged branches can be cut off and the cutting can be rooted. As with cacti, the pruning cuts can be dusted with fungicide. Always consider the size, shape and form of these plants before using them in landscape settings; their form is best when left undisturbed and there is no pruning method that can keep a large specimen small.

All aspects of pruning in the desert cannot be treated adequately here, but the following suggestions can be broadened to meet most situations. Always consider the restrictive climate of the desert. Pruning should be carefully planned as to time and amount; moderation in pruning is important to avoid overexposing plants to the difficult conditions they must endure, and this moderation will help define rather than eliminate a desert plant's greatest beauty, its natural form. ❧



Greg Star

The more vigorous leaders of *Leucophyllum frutescens* should be cropped back to maintain a good shrub form.



Eva Melady

AN INVITATION TO JOIN AND ENJOY

**A man does not plant a tree for himself;
he plants it for posterity.**

—Alexander Smith

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.....cut off here

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BROOKLYN BOTANIC GARDEN RECORD

PLANTS & GARDENS

BULBS

Vol. 37

Autumn (November) 1981

No. 3

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Brooklyn Botanic Garden Record, Plants and Gardens (ISSN 0362-5850) is published quarterly at 1000 Washington Ave., Brooklyn, N.Y. 11225, by the Brooklyn Botanic Garden, Inc. Second-class-postage paid at Brooklyn, N.Y., and at additional mailing offices. Subscription included in Botanic Garden membership dues (\$15.00 per year). To others, \$5.00 per year (\$8.50 for two years).

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POSTMASTER: Send address changes to BROOKLYN BOTANIC GARDEN, Brooklyn, N.Y. 11225



A May Day basket of tulips, daffodils, pansies, English ivy, evergreen euonymus and false-cypress brightens a New England door.

LETTER FROM THE BROOKLYN BOTANIC GARDEN

What magic of nature it is, planting something that resembles the kitchen onion and seeing flowers emerge in a few weeks or months! Most gardeners think of tulips and daffodils when they consider bulbs, and these are in fact among the most colorful, but there are a host of other sorts. Some fall into the category of flowering studs, others are refined diminutive sorts—little gems of the rock garden. Not all of them are necessarily showy, or spring bloomers, or winter hardy; a number naturalize beautifully in meadows. Briefly, there are bulbs for every taste, for every season. Why not explore some new kinds soon?

All too many years have passed since the last BBG *Handbook on Bulbs*, and we are indebted to co-guest editors James Fanning and Susan Gilbert for bringing us up-to-date. Thanks to the fine list of contributors they have enrolled, the gardener will find in these pages a wealth of information on the common and not-so-common bulbs. A warm word of appreciation should also go to the Netherlands Flower-bulb Institute, which has made possible some of the photographs.

The subject is vast, and some bulbs or rhizomes are covered more thoroughly in other BBG Handbooks, such as bearded iris in *Perennials and Their Uses*, and cannas and gladiolus in *A Gardening Primer*. Also, since they are but a tiny minority, the less said about the really invasive sorts, the better. However, a word of caution should be given about that deceptively-pretty aggrandizer, the star-of-Bethlehem (*Ornithogalum umbellatum*). Like coltsfoot and dandelion, it is best appreciated along the roadside.

One of the strongest testimonials to the beauty of bulbs is the Brooklyn Botanic Garden in spring. Since the 1920s, Boulder Hill near the Administration Building each April becomes Daffodil Hill, a study in bright butter-yellow. After several weeks the flowers fade, and in the distance a simulated meadow of fragrant white poet's narcissus begins to bloom.

There is a fine tulip display near the waterlily pools at BBG, too, thanks in good part to the generosity of the Netherlands Flower-bulb Institute. To ensure the finest display, the tulips are treated as annuals, being lifted after bloom and replaced with bedding plants, and new bulbs are set out each autumn. Species tulips tend to live longer in the garden, and a number of them are to be found in the perennial borders near the Conservatory. Whether at BBG or in the home garden it is important always to have something to look forward to, and bulbs do their part in fulfilling the hopes of long winters.

A personal favorite? In my own garden I am fond of a smallish South African bulb which in California has been dubbed "society garlic" (*Tulbaghia violacea* 'Variegata'). It looks much like a silver- and green-leaved allium, with lavender blue flowers lasting six or eight weeks in summer. Society garlic is not winter-hardy much north of Virginia, but it can be grown easily indoors during the winter months, making a distinguished and unusual house plant. We grow it under artificial light, then set out divisions in the garden in May.

Make the coming year the Year of the Bulb in your garden.

Sincerely,

Frederick Mc Gourty

Editor



Among the earliest bulbs are crocus (left). Their easy culture, hues of white to yellow and blue through purple, and willingness to naturalize, make them a great favorite. Below, a spring day at the Brooklyn Botanic Garden draws winter-weary visitors to the extensive show of bulbs, wisteria and other spring blooms. Opposite, Daffodil Hill at BBG where over ten thousand daffodils have been naturalized.





Daffodil Hill at the Brooklyn Botanic Garden

THE PLEASURES OF BULBS

Richard W. Langer

Every spring I marvel anew when the seeds I have planted break through the earth as seedlings. This fascination with nature's energy and the information stored within the seeds would have remained unsurpassed had it not been for my discovery of bulbs some years ago. Obviously it wasn't my discovery, bulbs having been part of nature for millennia. But, like all gardeners, I continually find something new in what is commonplace to Mother Nature.

Bulbs, unlike seeds, are prepacks. They are whole miniaturized plants, complete with embryonic flowers, packed neatly

into their own self-contained food parcel composed of numerous bulb scales, which are specialized leaves. If you cut a bulb in half from tip to base—of course, that means one less bulb to plant—you can actually see the individual leaves, the embryonic flower stalk, and the bud tightly compressed in the central cylinder.

To grow, the flower needs only moisture and light. That is how daffodils, tulips, hyacinths and other bulbs can be forced to bloom out of season, in winter, when their cheerful colors can do so much to brighten up the gray days before the advent of spring. 🌷



*Getting the best value
depends on how you approach . . .*

LANDSCAPING WITH BULBS

Joseph Hudak

Flowering bulbs, with their wide range of colors and distinctive silhouettes, are suited for every landscape. Able to endure more neglect than sometimes suspected, bulbs are reasonably simple to grow, inexpensive for the beauty they bring to the landscape, and generally permanent if given good drainage and the correct amount of sunlight. Many of them colonize readily by underground bulblets or by self-seeding, handsomely repaying your initial investment in short order. No matter how small your garden is, it can include some

bulbs blooming in spring, summer and fall.

Bulbs need several months of root-producing time in the ground in order to activate top growth and bloom. Spring-flowering bulbs must be planted the previous autumn to root sufficiently. Summer-blooming ones are set out in spring to bloom in the summer. Before you purchase them, some thought should go to the placement of bulbs. It helps to look ahead several months to their blooming time and to visualize which varieties will harmonize with the shrubs, vines and perennials al-

Opposite, a geometric spring bulb garden is set off by white gravel. When bulbs die down, later plants cover the passing foliage.

ready in the garden. You should know the color, height and blooming time of every bulb you plant. A good practice is to draw a map of where they will go in your garden and to have a list of varieties, categorized by flowering time, before you place a bulb order.

Starting Points

Beginners should select the easy-to-grow bulbs first. These are not only the most economical for large quantities, but are also conveniently available from many sources. Crocuses, snowdrops, scillas, grape-hyacinths and daffodils fit this category, and they have a good range of flower shapes and colors. Once you have

succeeded with these basic bulbs, you can add others the following year. Bulb landscaping is addictive.

The first rule of thumb for landscaping with bulbs is to plant the same type together, preferably in clumps of twelve or more, for uniformity of foliage texture and color as well as for easy maintenance. Avoid polkadotting the garden with one bulb here and one there. Resist, also, stringing the bulbs into soldier-straight lines, since bulbs always look best when closely massed. Provide a minimum of three rows of depth in all clustering, but where space is available, be generous. No one has yet complained of too many attractive bulbs in bloom. Massing bulbs also allows you enough flowers to cut for indoors without destroying the garden display.

Another rule to follow is to place tall bulbs such as lilies, late tulips, camassia and crown imperial either in the background of a border or among similarly sized shrubs or perennials. Short bulbs such as crocus, chionodoxa, scilla, snowdrops and autumn-blooming crocuses and



Most bulbs are quite versatile, adapting to formal plantings or random, casual drifts in a lawn. Good soil preparation and fertilizer help encourage good blooming. Above is the large-cupped daffodil 'Binkie'.



Above, tulips in a formal border lead the eye to the rhododendron at the head of the horseshoe and the dogwood in the story above. Left, lilies, the queens of the garden. Heights can range to six feet and the color selections are almost limitless, making them both elegant and useful in the summer garden.

colchicum are effective as seasonal ground covers naturalized in woods and meadows and as broad carpets in shrub borders or around trees.

Bulbs are not as bothered by dry soil (except when in bloom) as they are by root competition from large trees and shrubs nearby. Surface-rooting trees such as Norway maple, beech and linden, and vigorous shrubs such as forsythia and Pfitzer juniper will choke out the bulb plantings all too soon. Ground-cover beds of ivy, pachysandra and creeping euonymus are also too densely packed with their own roots to allow bulbs a good chance of surviving for long. However, periwinkle (*Vinca minor*), which is shallow-rooted, seems a friendly companion, at least for the more vigorous kinds of daffodils and lilies.

Lilies, most of which are summer bloomers, look best clumped near sitting areas or often-used walkways. Many varieties emit a powerful, sweet fragrance. Most have showy flowers—large and colorful. However, lilies tend to be top-heavy in bloom and usually need staking, especially before summer storms. This should be managed discreetly so they maintain a natural look. Tie them loosely at several points up the stem on a slender but sturdy pole. Keeping lilies secure but still free-flowing is the trick to using them in the landscape.

Other Points

Another guideline for landscaping with bulbs is to limit yourself to a range of tints and tones within one color value, such as a daffodil display ranging from white

through deep gold or a tulip collection that melts from deep claret to pale pink. Avoid grouping bold colors unless you mediate with some white flowers and gray-toned foliage. Make sure you select bulbs whose flowers harmonize with the other plants nearby and with the buildings. All the elements in the landscape should complement each other.

After bulbs finish blooming, their foliage should be allowed to ripen and turn brown before being cut. This is because the leaves, through the process of photosynthesis, are providing nourishment for the bulbs for the next year's blooms. If you are concerned that ripening foliage will mar the appearance of a flower bed, you can disguise the foliage by interplanting the bulb groupings with later-blooming perennials, which will soon grow up around the fading bulb leaves. Plants such as Pyrenees crane's bill (*Geranium endressii*), astilbe, perennial baby's-breath, artemisia, daylily, hosta and even ferns offer good screens, besides giving a second period of garden interest in the same space. Though most annuals are too small to hide bulb foliage before it ripens, they are sufficiently shallow-rooted to be interplanted with bulbs without taking nourishment from the latter.

Landscaping with bulbs—as with any other garden plants—requires some prior knowledge of what conditions they need to do their best. Bulbs are not unduly complicated to grow. They can bring a wide variety of shapes, sizes and colors to your landscape and open new worlds of visual pleasure to you. ❧

A Few Definitions based on *Hortus Third*

Bulb. A usually subterranean modified leaf bud, consisting of a short thick stem and crowded, fleshy scales or leaf bases, and serving as a storage organ.

Corm. A solid, swollen part of a stem, usually subterranean, as the so-called “bulb” of crocus.

Rhizome. Rootstock, a usually horizontal stem on or under the ground that sends up a succession of leaves or stems at the apex. [Most iris are rhizomatous.]

Tuber. A short, thick, usually subterranean stem or branch bearing buds or “eyes” and serving as a storage organ, as in the potato. ❧



Crocus in a late snow

Beginning in winter . . .

THE SPRING GARDEN PARADE

Gustave Springer

Though the first day of spring does not arrive until late March, our psychological calendars tell us that winter ends with New Year's Day and that spring is then just around the corner! We begin to yearn for the first flowers to open and warm our souls. As I start to write this article one winter day, I take spiritual sustenance from the indoor garden that graces my windowsill—a few pots of daffodils, a combined one of crocus, *Iris reticulata* and early tulips, and still another of pink, blue and white hyacinths. They will suffice until the real show begins outdoors.

Of all plants the flowering bulbs are the most rewarding for me, and this is partic-

ularly true of the spring kinds. They are the first sign of Mother Nature's plant world stirring from its winter slumber. This can be as early as January in mild climates, as late as March in the northern United States and Canada.

Here follows a description of various spring bulbs in approximate order of bloom. The flowering times will depend on climate, vagaries of the weather in a given spring and the location in which the bulbs are planted (for example, near a house, in full sun, in partial shade).

The Earliest

The curtain raisers in most areas are the

small bulbs, the leaders being snowdrops (*Galanthus*), winter-aconite (*Eranthis*) and snowflakes (*Leucojum*). Each has several species and garden forms.

Galanthus has teardrop-shaped flowers in white with a green base and does very well in sunny locations. These low-growing bulbs are excellent garden companions for a cluster of yellow winter-aconite—a short, buttercup-type flower. Both will multiply over the years and eventually become naturalized. They are as low-maintenance plants as can be, and they cost but a pittance, as do most of the small bulbs.

Iris reticulata adds another visual dimension to the early spring garden. It has attractive dainty blue and purple flowers, and stands only 6 or 8 inches tall. There are several named varieties. Another species, *Iris danfordiae*, is yellow-flowering and emits a sweet scent. It is short-lived but bulbs are inexpensive. Both of these iris make bright accents in front of other bulbs or in the rock garden.

Without doubt the most popular early bulb is the crocus. Crocuses range in height from 3 to 10 inches. Though not always the first flowers to open in spring, they are the first to offer a wide range of colors: white, yellow, lavender, blue and striped combinations of these hues. The very early sorts with small flowers are the species crocus, many named varieties of which are derived from *C. chrysanthus*. The larger-blooming, later ones are called "Dutch" crocus. Crocuses will multiply from spring to spring and become naturalized in your garden or lawn.

Further Along in the Procession

Chionodoxa, or glory-of-the-snow, has light blue flowers with white centers. Some kinds have pink blossoms. Chionodoxa is particularly effective mass-planted on banks, near rocks or under shrubbery. *Puschkinia libanotica*, or Lebanese-squill, has attractive soft blue or white flowers. It is a good companion for chionodoxa.



Galanthus nivalis, the snowdrop, is one of the earliest harbingers of spring. The tip of the inside drop is a muted green in contrast with the deep green cap.



Above, the brilliant buttercup-yellow blooms of winter-aconite pop up very early in the season. In the right spot, they will form a ground cover with persistent, fine-cut foliage. Below, the double form of spring snowflake (*Leucojum vernum*). The edges of the petals are spotted deep green in this, another early bulb.



Given a well-drained and fertile soil, both will increase from year to year.

Fritillaria meleagris, the checkered-lily, has unusual flowers—nodding purple or white bells with purple checkers. It grows best in a cool, partially shaded location in a rock garden, under trees and between shrubs.

The first tulips in the spring parade are the kaufmannianas, often referred to as the water-lily tulips. These low-growing short-stemmed kinds have large wide-open flowers in red, yellow and cream.

A few of the species tulips such as *Tulipa praestans* 'Fusilier' (multi-flowering, red) and *T. tarda* (dwarf with white flowers and yellow eye, usually 3 to 5 blooms per stem) are among the earlier tulips to grace the garden. The latter persists well from year to year and lends itself to naturalizing better than do many other tulips.

Anemone blanda, the Grecian wind-

flower, blooms in blue, rose, white or purple. The flowers, appearing much like little daisies, make an excellent carpet under early tulips and daffodils. Separate colors are often available. Don't mistake these windflowers for the bold-blooming 'St. Bavo' and 'DeCaen' anemones, which are referred to as florists'-poppies. The latter are attractive in southern and western gardens but need winter protection in the North.

Grape-hyacinth, the best known of the *Muscari*, is a low pagodalike flower of tiny blue or white clustered bells. The flowers resemble bunches of upside-down grapes. Grape-hyacinth is attractive in rockeries but is best used in the flower bed, especially in combination with bright yellow daffodils and red fosteriana tulips. The bulbs should be planted quite closely for ideal effect.

Fosteriana tulips produce large flowers



Following later in spring, daffodils and grape-hyacinth (*Muscari*) offer almost endless combinations of white, yellow, orange, blue, purple and pink, as well as the bright green of the foliage.

on strong stems. They go well with chionodoxa as well as with grape-hyacinth. The most famous tulip in this class is the dazzling scarlet 'Red Emperor', which in turn has been a parent of most of the Darwin hybrid tulips.

The single and double early tulips bloom at the same time in the season. As their names imply, the former's flowers have the normal single row of petals, and the latter are full blooms with two (or more) rows. There are many varieties in many colors. They tend to do best in regions with long cold winters. Heights are between 8 and 12 inches.

The Mainstays of Spring

Scilla siberica, or Siberian-squill, bears clusters of three or four intense blue flow-

ers formed like wide bells pointing down. The flowers, which last an unusually long time, show up well at the base of trees and shrubs. Bulbs naturalize readily. *S. tubergeniana*, with pale blue or white-tinted blue flowers, is another good squill.

Trumpet and large-cupped daffodils dominate the early midspring garden. The all-yellow, all-white or bicolored yellow and white flowers look bright and fresh in meadows, among trees and in random clumps in the garden.

In the midspring garden are *Tulipa greigii* hybrids of varying heights. Flowers are

Spanish squill, *Endymion hispanicus*, is a prolific bloomer in white, blue and light purple-rose. It rarely needs dividing, coming back year after year.



Gottschalk-Schlesinger

striking red, yellow, orange and combinations of these colors. The foliage itself is distinctive, with purple streaks and spots.

Triumph and Mendel tulips, blooming at roughly the same time as the greigiis, were developed originally for commercial cut-flower production but are also very adaptable in the garden. Varieties in both classes bloom in a wide range of hues, solid and bicolored. They bear the traditional cup-shaped tulip flowers.

One of the most spectacular classes of tulips, the Darwin hybrid, blooms in midspring. Darwins have large flowers and sturdy stems able to withstand a good wind. Brilliant shades of reds and yellows predominate.

After the trumpet and large-cupped dafodils have faded, the small-cupped sorts and poet's narcissus (poeticus), triandrus and jonquil divisions come on stage. All of them are graceful, many are fragrant. Most of the flowers are yellow or white, but there are also pinks and oranges. (See page 30.)

Crown imperial (*Fritillaria imperialis*) introduces an unusual shape to the mid-spring garden. The striking clusters are composed of pendulous orange or yellow flowers, with tufts of green above. The stately blooms stand proudly atop a 3- to 4-foot stalk.

Late Spring

Tulips are the dominant flower of late spring. Parrot tulips have petals that are

feather-edged and streaked, making for a truly distinctive flower. Colors range from white to dark maroon and include bicolors.

The double late tulips resemble peonies. Their flowers are full with two rows of petals like the early doubles. They look best planted close together and benefit from a location protected from wind.

Lily-flowering tulips have graceful flowers with pointed, reflexed petals on slender but wiry stems. Colors: bright pink, red, rose, yellow, lilac and white. Cottage and Darwin tulip varieties are tall growers with a broad spectrum of colors. Cottages usually have oval blooms, Darwins are flat at the base.

In late spring there is also the Spanish squill or bluebell (*Endymion hispanicus*), with tall clusters of blue, pink or white bells. They are especially attractive planted under trees in a natural setting.

Alliums (see page 45) accompanied by Dutch iris bring down the curtain on the spring bulb show. The Dutch iris, usually 12 to 18 inches tall, flower in shades of blue, white, yellow and purple. They are beautiful planted near a pond or stream and yield excellent cut flowers for the home.

If you plant bulbs that begin blooming in late February and early March, and follow up with bulbs for each interval through late spring you can have color nonstop through the season. And if you think of spring as beginning with the first flower, you really won't have very long after New Year's to wait. ♣

Iris for Late Winter

There are a number of iris besides the tall, bearded rhizomatous kinds which bloom so beautifully (if fleetingly) in the latter part of spring. To have very early bloom in the garden, grow a low-growing bulbous species or two. *Iris reticulata* is the best known and probably most dependable. 'Cantab' (light or Cambridge blue flowers), 'Harmony' and 'Joyce' (both violet-blue with gold crest) are first-rate.

I. histrio var. *aintabensis* is mid-blue, blooms in January in Tidewater Virginia, late winter further north. *I. histrioides* var. *major* is darker blue, and blooms slightly later. Blossoms are borne very close to the ground. Because of its low stature this iris is often grown in alpine houses, although it is hardy outdoors in the North. *I. danfordiae* is yellow, spotted with olive-green. Best treat this as an annual and plant a few new ones each autumn. ♣



Peony-type dahlia, 'Jersey Beauty'

For garden color and cut flowers . . .

Summer-flowering Bulbs

Carl Totemeier

While flowering bulbs dominate the spring garden, they are, with few exceptions, ignored in summer plantings. Yet, among the great variety of summer-flowering bulbs available, there is a rich diversity of color, form and height. Summer-flowering bulbs

are at home in both the flower border and cutting garden, and some provide the added bonus of fragrance.

Among the more widely planted summer-flowering bulbs are the dahlias. Tall varieties with their 5 to 6 foot stems are

a mainstay at the back of the flower border in late summer. Their flowers range in size from 2½-inch pompoms to decoratives the size of a dinner plate. They are excellent for cutting, although some may be too large for most flower arrangements.

Too few gardens grow the dwarf and intermediate dahlias. At 12 to 40 inches in height, they seldom require support and are ideal in the front or toward the middle of the border. In spite of their short stature, they have stems of sufficient length for cutting. Their flowers, which seldom exceed 4 inches in diameter, are ideal for most arrangements. As an added advantage, some may be started from seed, eliminating the need to dig and store their tender tubers from one season to another as must be done with tuber-propagated dahlias. If started early indoors, they will flower from late spring until frost.

Gladiolus and Its Relatives

Gladiolus are also on the list of widely planted summer-flowering bulbs. While excellent for cutting, their bold, linear-flowering spikes prevent them from blending well in the border. The giant exhibition

types with their 3½ to 4 inch flowers on 3 to 4 foot spikes are almost too large for most cutting purposes. The more delicate and graceful Butterfly and Miniature types are, perhaps, a better choice. The former have contrasting butterfly-shaped markings in their throats, while the latter have smaller flowers.

A number of gladiolus relatives, though similar in appearance, have gracefully arching flower spikes and are more versatile in the garden. Yet they are not widely grown. They flower from mid- to late summer.

Acidanthera has fragrant white flowers with chocolate brown throat markings. Borne on 2 to 3 foot spikes, the individual florets may be cut for use in small arrangements. This often causes side shoots to appear.

Crocasmia and *Tritonia* are somewhat similar in appearance, and both have been called *Montbretia* by one authority or another. Hybrids of the two exist. Both produce 1½ to 2 inch yellow, orange, rose, red or pink flowers on 3 to 4 foot arching spikes from mid- to late summer.

Babiana (baboonroot) is another inter-



A miniature cactus-type dahlia, 'Park Princess', has 4-inch bright pink blooms. The miniatures or dwarfs are good for edging and cutting.



Gladiolus florets come in a wide variety of shapes—dove-like, orchid-shaped, upright and others—as well as colors and blends. They are very handsome at the back of a border or in a massed bed.

Gloriosa, the climbing-lily, has modified, twining leaf tips to grasp support. The brilliant yellow flowers grow progressively deeper red toward the end of the sharply recurved petals.

esting summer bulb. Similar to freesia but shorter, each spike may produce as many as twenty scented blue, rose, crimson, yellow, violet or white flowers in early summer. Their interesting name was acquired as a consequence of being a favorite food of baboons in their native Africa.

The flowers of *Tigridia* perch like giant 5 to 6 inch butterflies atop 18 to 30 inches stems. Half-a-dozen flowers appear, one at a time, over a 4 to 6 week period. The flowers are uniquely triangular in form. Their three large petals enclose three smaller ones which all come together to form a shallow cup at their base. The large petals may be yellow, orange, scarlet, pink, lilac or buff. The cups of most flowers are spotted, giving rise to the common name, tiger flower.

Belamcanda produces clusters of 2-inch, orange flowers with red spots on 2½ to 3 foot stems. While each blossom lasts only for a single day, they continue to appear over several weeks in mid- to late summer. The common name, blackberry-lily, comes from the cluster of black shiny seeds which together resemble that fruit. The fruits are used in dried arrangements.

The Lily Family

Alstroemeria, the Peruvian-lily, bears clusters of yellow, pink, lilac, orange or white orchidlike blossoms on 2 to 3 foot stems from June to August. The petals may be streaked or mottled with green or brown; some are fragrant.

The trumpet-shaped flower of *Hymenocallis*, the Peruvian-daffodil, appear in mid- to late summer. The flowers, borne on 2 foot tall leafless stems, have unique spidery, reflexed petals which have given rise to an additional common name, spider-lily.

Polyanthes or tuberose is almost too fragrant to be agreeable indoors, otherwise



it is a fine cut flower. The tubular white flowers are borne on 1 to 3 foot stems. A double-flowered form is widely planted.

Longtime favorites for growing in containers and massed in beds are caladiums with their colorful 12 to 24 inch tropical foliage. The leaves may exhibit almost any combination of red, pink, silver, white or green. They are suitable for planting in either sun or partial shade and do best if kept moist. Virus-free tubers will soon be readily available and give promise of greatly increased vigor.

Three lesser-known members of the Lily Family are worthy of mention. *Galtonia*, summer-hyacinth, produces white pendant, bell-shaped flowers on 3 foot stems. Its height and form make it well suited for planting at the back of the border. *Eremurus*, foxtail-lily, grows from 3 to 7 feet tall. Their giant spikes are covered with a multitude of delicate flowers and buds which bloom from the base upward. They remind one of giant bottle brushes. They not only are valuable for accent in the back of the border, but make excellent cut flowers as well. They are, however, too tall for most arrangements. *Gloriosa*, climbing-lily, is a unique member of this family in that it climbs by means of twining tendrils. Its red and yellow flowers have sharply reflexed petals. *Galtonia* and *Eremurus* flower from mid- to late summer, while

Gloriosa will flower throughout the year if moved indoors during the winter.

Other Summer Bloomers

Zantedeschia or calla-lilies are not lilies at all but are related to caladiums. They are grown both for their showy flowers and their attractive foliage. Varying in height from 2 to 4 feet, the flowers consist of an upright, golden spadix with many tiny flowers surrounded by an attractive petal-like sheath or spathe. They flower pretty much over the entire season if kept well-watered and fertilized. *Z. aethiopica* has white flowers on 3 foot stems, *Z. godfreyana* has creamy white flowers, *Z. rehmanii* *superba* is a dwarf pink form, *Z. albo-maculata* has creamy white flowers with purple throats and *Z. elliottiana* has yellow flowers. The last two have white markings on their leaves. They are good for cutting and as container plants in the North. In the South, they may be grown in the garden and are especially well-suited to moist situations.

Liatris or gayfeather is a very hardy plant with tall spikes of fluffy white, lavender or lavender-rose florets. It is excellent for cutting and useful for bold accents in the late summer garden. Some may reach 6 feet tall. Flowers are unusual in that they open from the top of the spike downward.

Lycoris, hardy-amaryllis or surprise-lily, produces leaves in the spring, dies down in early summer, then produces flowers on leafless stalks in late summer. Clusters of orchid-pink flowers are borne atop 2 to 2½ foot stems. *Lycoris* does well in sun or partial shade and is well adapted to naturalizing in beds of ground cover.

Of the above, *Belamcanda*, *Eremurus*, *Liatris* and *Lycoris* are quite hardy and require only a winter mulch for protection in areas where the winters are cold and the soil freezes deeply. The remaining plants must have their bulbs, tubers, corms or rhizomes dug before the ground freezes and stored where they will be protected over winter. ❧



The hardy-amaryllis, *Lycoris*, blooms in late summer after its foliage dies back. Because of this trait, it looks best in "borrowed clothes" among the foliage of ground covers.



Carnation-flowered tuberous begonia

Tuberous Begonias

They are not for every part of the United States, but in the northern reaches, in Canada or along the Pacific Coast, where summers are cool, this strikingly beautiful group of plants adds flower color in every shade but blue to partly-shaded patios, hanging baskets and, occasionally, borders. Classified botanically as *Begonia x tuberhybrida*, the group is derived from at least six different species, all native to South America. There are thirteen subdivisions based largely on flower shape (camellia-flowered, crested, rosebud, daffodil-flowered, and so on). Some ('Pendula') lend themselves especially to hanging baskets, others ('Multiflora') are compact and mainly used for bedding.

Tubers are frost tender. They should be purchased from bulb dealers in winter and started indoors in pots, then transplanted outdoors after danger of freezing is past; or young potted plants in bloom may be purchased directly from garden centers in May or early June. Soil mixes vary but should be fairly rich, *e.g.*, two parts compost or dried cow manure to one each of pasteurized soil, sand and peat moss. Tuberous begonias are hungry feeders. They benefit from incorporation of a slow-release fertilizer in the mix or from frequent light applications of a water-soluble fertilizer. Water requirements are high. Plants need a spot protected from wind, for canes are brittle; early staking is needed for some robust growers. Mildew, a problem in some areas, can be controlled by periodic applications of Benlate. After autumn frost, plants are brought in, foliage removed and pots stored on their sides in a cool dark room; or tubers can be removed and stored in dry peat moss or sand.

Sound difficult? Begonia fanciers don't think so, and a number of the finest northern gardens have hauntingly beautiful collections, sometimes grown in lath houses to give just the right shelter from the summer sun. (For culture of Rieger begonias see E. L. Miller's article on page 41 of BBG Handbook #79, *Gardening Guide*.) ❀

Autumn crocus (*C. speciosus*)

AUTUMN BLOOMERS

Frederick McGourty

Apart from chrysanthemums, asters and Japanese anemones, there are few fall-flowering plants in American gardens. This is a pity, because some of the lesser-known bulbs can give a refreshingly different dimension to the garden and an aesthetically pleasing contrast to the daisy forms we associate with September and October.

There are even a few true crocuses that bloom in fall, including the fabled *Crocus sativus*, the stamens and pistil of which produce the saffron of commerce—at \$140-or-so an ounce. A more dependable crocus for the autumn garden is *C. kotschyanus* (*zonatus*), with pale rose-lilac flowers that look well emerging from a low

ground cover such as periwinkle (*Vinca minor*) or barren-strawberry (*Waldsteinia fragarioides*). Corms persist in the garden for years as far north as central New England, and they will spread modestly.

Of greater stature but still fine in a bed of periwinkle or naturalized in rough grassland is *Colchicum autumnale*, which is confusingly referred to sometimes as autumn-crocus. The corm, which yields the poisonous alkaloid colchicine, has had medicinal importance in the treatment of gout, and plant hybridizers employ the same substance to alter the chromosome numbers of their subjects. Flowers are usually light purple but color ranges from rose pink to white depending on variety.

Colchicum, like *Lycoris*, is a horticultural nude, which is to say, it blooms without its foliage. Leaves are straplike, appear in spring, then wither in early summer. Red spider-lily (*Lycoris radiata*), a native of China and Japan, is naturalized in warmer parts of the United States, as

much a part of the southern scene in autumn as Bear Bryant at a University of Alabama football game. In the North opt for the hardy-amaryllis (*L. squamigera*), a late-summer bloomer which looks at home emerging through peony foliage. Flowers are rose-lilac or pink.

Tired of lavender? Try *Sternbergia lutea*, the so-called winter-daffodil. It looks like a big yellow crocus in autumn, and the flowers come with leaves. In some gardens *Sternbergia* is the last plant to bloom before the ground freezes. Bulbs may be grown in southern New England, but are more dependable in the South.

In the view of some gardeners the big florist's cyclamen, which is grown indoors as a holiday gift plant, has given a bad name to the genus because of its obesity. There are refined little woodland sorts, too, the hardiest being *Cyclamen hederifolium* (*neapolitanum*). It has marbled foliage and delightful, small rose pink or white flowers. Plants colonize in time,

George Talbouis



Colchicum autumnale, like *Lycoris*, blooms after its leaves have gone. In pinks or white it is a bright note in a lawn or ground cover.



Bright yellow and up to one foot high, *Sternbergia lutea* is a very late bloomer. Native to the Holy Land, it is the Biblical "Lily-of-the-Field."

from tubers which bear an uncanny resemblance to cow plops. At Powis Castle in Wales, *C. hederifolium* is densely planted with a romping ground cover of purple-leaved violet (*Viola labradorica*). This is an elegant combination for an informal corner of a lightly shaded garden.

All of these bulbs are of routine culture: sun (except as noted) and well-drained soil of moderate fertility, with compost and a little superphosphate or bone meal dug in at planting time. They are in bulb catalogs

but should be ordered for late-summer planting, except cyclamen, which is usually planted in spring.

Try these bulbs and you may want to go on to other less-common sorts, such as rose-purple *Scilla scilloides* (*chinensis*) or *S. autumnalis*, and the variegated Italian arum (*Arum italicum* 'Marmoratum'). The last, adapted to the Middle Atlantic states and milder areas, might be called a Mediterranean jack-in-the-pulpit, with striking orange-scarlet fruit in autumn. ❀

Flower of the West Wind

Zephyranthes—literally, flower of the west wind—is a genus of bulbs native to the warmer parts of the Americas. One species, the Atamasco-lily (*Z. atamasco*), is from the southeastern United States. It resembles a big white crocus and can be found giving a moment of spring grace to the roadside ditches there. Atamasco-lily has another dimension of beauty when it is seen in big swaths at Brookgreen Gardens and Magnolia Gardens in South Carolina, where it is a fine complement to the azalea displays. It obviously prefers shade and moisture.

Zephyranthes candida, the rain-lily, is more adaptable in cultivation than Atamasco-lily, and it is slightly hardier despite its South American origin. White flowers, sometimes tinged pink, appear virtually overnight after a good rain. Rain-lily is dependable in gardens as far north as coastal Virginia. (Other species, pink and yellow, are not as tolerant of cold.) Rain-lily grows best in sun and moist soil; sand enriched with peat works well. Bulbs grow quickly and need separating every several years. Peak bloom is late summer, but a few flowers may occur anytime. Bulbs are very inexpensive, and lend themselves to naturalizing in the South, summer pot culture outdoors in the North. ❀

PLANTING AND CARE

Eric Rosenthal

Creating a well-designed bulb garden requires a bit of artistry. Planting and caring for a bulb garden also requires some craftsmanship. Fortunately the craft itself can be learned by anyone, provided a few rules are followed.

First and foremost, use high-quality bulbs from a trusted source. Bargain-base-ment bulbs don't yield blue-ribbon winners.

Second, preparing the soil for planting is a time-honored procedure that pays dividends. For formal bedding of bulbs, cultivate the earth with a spade or fork to a depth of twelve inches and dig in sand and organic matter such as peat moss or leaf mold to lighten clay soil or to give substance to sandy soil. Note that good drainage is essential for nearly all bulbs.

Most bulbs tolerate a range of acidity levels, the ideal pH being 6.5—slightly acid. If soil is unduly acid, it is easy to bring it closer to neutral by incorporating dolomitic limestone. Most land-grant universities offer soil-testing services for a nominal fee through their schools of agriculture. It is well worth your effort to have the soil tested if you have no idea of your soil's qualities.

Like other plants, bulbs respond to nitrogen, which encourages leafy growth, and particularly to phosphorus, which aids root development and flowering. Both can be incorporated in the soil at planting time, in the form of a balanced fertilizer, *e.g.*, 10-10-10. Because most soils east of the Mississippi are deficient in phosphorus, many gardeners choose to incorporate superphosphate or bone meal at planting time, too. Phosphorus is not very mobile in the soil so it should be dug in thoroughly, not broadcast on the surface. Bone meal is milder, proportionately more expensive and time-honored, but it may attract your neighbor's dog, not to mention your own.

The depth for planting spring bulbs depends on the size of the bulb and the climate. Large ones such as tulips, daffodils, hyacinths and crown imperial should be set 6 or 8 inches deep in the North and 4 inches deep in the South. Plant small bulbs such as grape-hyacinths, snowdrops, crocuses and scillas 3 or 4 inches deep in the North, 2 inches deep in the South. If in doubt, use the old rule of thumb—plant 3 times as deep as the height of the bulb. Space large bulbs about 6 inches apart and small ones 2 or 3, regardless of climate. Many of the small bulbs look best simply grown in clumps.

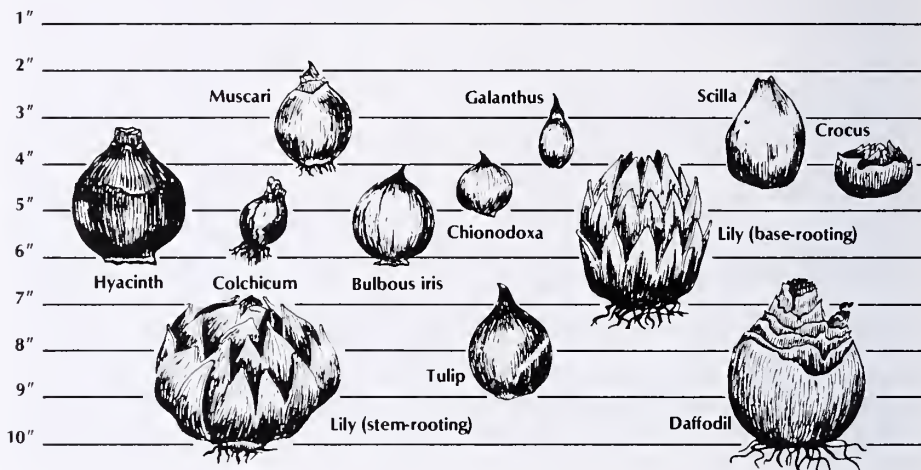
Making individual holes for the bulbs is time-consuming, so try digging an area large enough for a good cluster, unless you are interested in formal bedding. Place bulbs, pointed tips up, at the appropriate depth, cover them with half of the removed soil, and water them thoroughly. Then cover with the remaining soil and water the bed again. This will speed growth if there is autumn dryness, as is often the case, even in the North. It might be mentioned here that, before planting, winter-aconite (*Eranthis*) benefits from soaking in water overnight.

After the ground freezes in late fall, mulch the bulb bed with several inches of salt hay, wood chips, pine needles or leaves. Mulch helps prevent frozen soil from thawing and heaving bulbs out of the ground, and it conserves moisture underground in times of winter drought. Actual freezing does not harm normally hardy bulbs. Remove salt hay or other non-decorative mulches in early spring as shoot tips appear. At this time some gardeners choose to make another application of fertilizer if they are growing bulbs for show, but this is unnecessary in the average home garden.

During fall and winter, while spring-

PLANT IN FALL

Ground Level



flowering bulbs are putting out roots and beginning to grow, normal rain and snow should provide adequate moisture. However, in parts of the country with prolonged dry spells in winter, bulbs should be watered every week or two.

After Bloom

When the petals begin to drop, cut the flowers just at the base of the individual stalks (scapes). Otherwise, plants will channel their energy to producing seeds, rather than the more important task of fortifying the bulb underground for next year's performance. Remove the foliage later in the season after the leaves and stem become dry enough to be pulled free easily. As long as it is green, foliage is serving its purpose, manufacturing energy for next year's bulb growth.

Spring bulbs can be left in place indefinitely. However, if you want to plant them in a different location next fall or if you want to remove ripening foliage from the site in spring and early summer, you can lift them from the ground. Dig the plants after they have finished flowering and set the bulbs and roots in a shallow trench in an out-of-the-way part of the garden. Cover bulbs and roots with soil and water them whenever the soil dries. When the

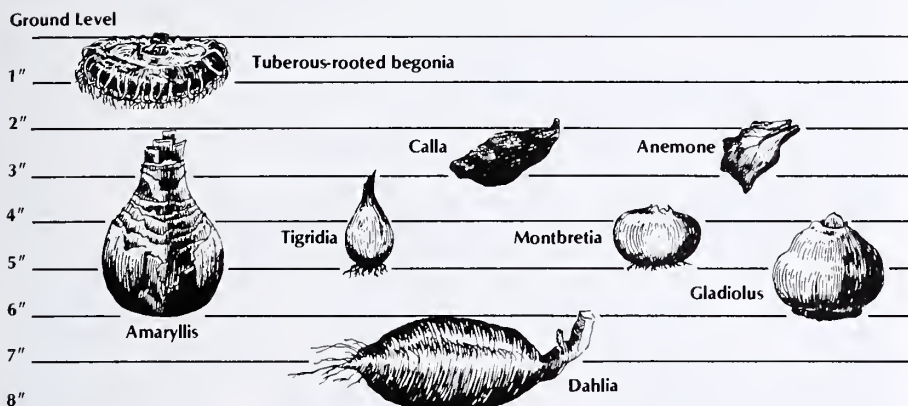
foliage has ripened, bring the bulbs into the garage or some other cool, dry place where they can be stored in a loose, open bag with peat moss or wood shavings. Keep them there until planting time in fall. This method requires extra effort, and most people prefer to situate their bulbs carefully in the garden so no lifting is needed.

Summer Bloomers

Many gardeners assume that the curtain comes down when late-blooming tulips bow out. But why not produce a show in two acts by planting summer-flowering bulbs? Gladiolus, dahlias, cannas, tuberoses, montbretias, tigridias and other tropical and subtropical bulbs should be set in the garden just when spring-flowering bulbs are waning. However, caladiums and tuberous begonias are particularly tender and should not be subjected to spring temperatures below 50°F. Start them indoors in pots in late winter to give them lead time before placement in the garden in late spring. In cooler parts of the North gardeners prefer to start some of the other summer bulbs indoors, too.

Even in parts of the country where gladiolus are winter hardy, they flower best if replanted yearly. Stagger planting dates to

PLANT IN SPRING



Time of year to plant, and depth of planting for temperate climates, where winters are cold
For frost-free climates, some kinds are planted at other seasons

extend the blooming season for them. After the last spring frost, plant gladiolus corms 4 to 6 inches apart at 7 to 10 day intervals up until 60 days before the first autumn frost.

Summer-flowering bulbs have more idiosyncrasies than their spring-blooming counterparts. One reason is that many of the former are not true bulbs, but roots or tubers. Depth and method of planting defy a simple formula. Tuberous begonias are planted at soil level, indented side up. Gladiolus go 4 to 6 inches down, pointed side up. Dahlias are planted horizontally 5 to 6 inches deep, tuberoses are placed upright 2 to 3 inches deep.

Most summer bulbs thrive best in direct sun, but tuberous begonias require part shade. Agapanthus, the lovely lily-of-the-Nile (actually native to South Africa), prefers direct sun in the North but partial shade in the South. To a degree, geography determines exposure, for full sun in Vermont is quite different from full sun in Georgia. In all but very cool climates the true lilies (*Lilium*), most of which are winter hardy, do best when shaded from hot midday sun; flowers last longer and their colors don't bleach.

Summer-flowering bulbs can tolerate just about any kind of soil as long as it is

well drained. The soil preparation techniques that worked in the fall also work in the spring, the incorporation of phosphorus being important in many areas. Soil should be kept cool and moist, so mulch with 2 or 3 inches of buckwheat hulls, cocoa bean hulls or similar material. This will also keep weeds down. Mulches sometimes attract slugs, which eat bulb foliage, and it may be desirable to scatter metaldehyde granules on the soil from time to time.

Fertilize summer bulbs at least once while they are growing. Upon planting them in the latter part of spring sprinkle a 6-inch-band of 5-10-5 or similar fertilizer around the base of each plant. Some people feed summer-flowering bulbs more frequently with a weak solution of a water-soluble commercial fertilizer or even with a mix of well-rotted cow manure and water, applied every three weeks.

Some plants, including the taller-growing kinds of lilies and dahlias, require staking even when grown in sites fairly protected from wind. Wire stakes with horizontal loops for stems are widely available in garden centers and are easy to use for single plants, as are group stakes with "eyes" through which green twine can be inconspicuously tied. In addition, bamboo



Bulbs respond best to well-prepared soil supplemented with superphosphate or bone meal. Proper planting depth is essential, although formal or random arranging is a matter of taste.

stakes or even sapling shoots which are straight may be employed, with plants attached at two or three points with green twine or Twist-ems. Stakes should be inserted in the soil *before* plants flop, and care should be taken not to pierce bulbs in the process! Also, stakes should be inconspicuous.

In cold climates summer-flowering bulbs must be lifted in autumn and stored during the winter for replanting in spring. After the foliage has become brown and shriveled in autumn following a light frost or two, dig the bulbs and let them cure in a warm, well-ventilated place for a few weeks. Then remove clinging soil, dust the bulbs with a mild fungicide and store in a paper or plastic bag filled with dry peat moss. Fold but don't seal the top of the bag.

During the winter summer-flowering bulbs and corms should be stored in a dry, cool (55-60°F) location such as a basement. Dahlias need a slightly cooler (40-

45°F) place, or their roots will sprout. If you can't provide these storage temperatures, invest in new bulbs the following spring. Most of the summer bulbs are inexpensive, and it may be easier and more practical in some cases to start with fresh stock.

Any Problems?

No plants are entirely disease- and insect-free, but bulbs are less troubled than most. A host of problems can be prevented by taking three precautions. First, do not use soft, mushy or blemished bulbs. All summer-flowering bulbs that develop bruises after winter storage, and spring-flowering ones that become bruised after summer storage (if done), should be discarded. Second, condition the soil properly before planting. Bulbs planted in well-drained soil are less likely to develop diseases than ones planted in soil with poor drainage. Third, plant bulbs at the correct depths.

If rodents are a nuisance, encase the

beds in a wire mesh cage. Dig down 10 inches and spread the mesh across the bottom, up the sides and over the top. A one-half-inch mesh is wide enough to let the bulb shoots and roots grow through yet small enough to keep out mice. Some bulbs (tulips, crocus) are more prone to rodent damage, others (daffodils, scillas) less.

Insect pests tend to plague bulb plants that were unhealthy to begin with. If insects attack growing plants, hand pick them or wash them away with a stream of water. A mild, all-purpose insecti-

cide can be used when other means fail.

During rainy or humid weather tulips, dahlias, gladiolus, hyacinths and tuberous begonias are particularly susceptible to a blight called botrytis or "tulip fire." This disease causes small yellow-to-reddish-brown spots on leaves, flowers or bulbs. Eventually the spots enlarge, grow together and become slimy. Sometimes a gray mold develops. The best precaution is to remove and destroy any bulbs or plants with these symptoms and not plant bulbs in that area the following year. ❧

Perennial Partners

Formal bulb gardens can be stunningly attractive, but many gardeners prefer to combine the larger bulbs with spring-blooming perennials to give greater breadth of form. There are a number of potentially good companions. Here are a few, starting with blue. Garden forget-me-not (*Myosotis sylvestris*), actually a self-sowing annual or biennial, has familiar small, light blue flowers with a yellow eye. *Brunnera macrophylla* (*Anchusa myosotidiflora*) is a perennial forget-me-not eventually with large, sculptured leaves which will obscure dying bulb foliage. In the same bluish cast but larger-flowered, smaller-leaved and more intense in color is blue-eyed Mary (*Omphalodes verna*). The Jacob's-ladder clan (*Polemonium reptans*, *P. caeruleum*) is a good mixer in blue, too. In a woodland garden Virginia bluebell (*Mertensia virginica*) is traditional with bulbs, but its own foliage dies by midsummer; in a shaded border substitute *Pulsanaria saccharata* 'Mrs. Moon', which has similar flowers and, eventually, large and long white-spotted foliage.

The native pink bleeding hearts (*Dicentra*) and their garden varieties are good companions for bulbs and will usually naturalize in light shade. Their flowers fade muddily, so *D. eximia alba* with white blossoms may be the better choice; plants of this are available mainly from rock garden nurseries. A brighter, more orange-red than found in dicentras is that of American columbine (*Aquilegia canadensis*). Flower form is exquisite. Plants are shade tolerant but may need insecticide for leaf miner.

Primroses of most sorts go well with bulbs, especially *Primula x polyantha*, *P. veris*, *P. vulgaris* and *P. denticulata*. *P. sieboldii* colonizes, is best in its white form. *Phlox subulata* has given a bad name to phlox in general because of its typical magenta or screaming pink form, but there are respectfully-subdued pinks, blues and whites. This is more or less the same with *P. stolonifera*, too. Blue phlox (*P. divaricata*) is usually fine; there is a white. Also, grow some violets and *Anemone pulsatilla*.

Yellow is a common bulb color, so the need for spring-blooming perennials with the same tint is limited. *Adonis amurensis*, itself a tuberous plant, blooms in earliest spring and is best in one of its double-flowered forms; leaves are beautifully cut, fading away before June's end. *Euphorbia epithymoides* (*polychroma*) has intense yellow bracts with greenish tinge in May, grows to two feet, and seeds itself freely. Shear it lightly after bloom if seedlings aren't wanted. Basket-of-gold (*Aurinia saxatilis*) is self-explanatory, but soft-toned selections are available. It is easy to grow in numbers from seed. Insist on a yellow daisy? Try *Doronicum* 'Miss Mason', which grows two feet tall and blooms for a month. ❧



Trumpet daffodils planted among evergreens

*Learn the basic types
for increased enjoyment of . . .*

DAFFODILS

Mary Lou Gripshover

Let me begin by answering that age-old question of new gardeners: "What is the difference between a daffodil, a narcissus and a jonquil?" Narcissus is the botanical name and daffodil is the common English name for the entire genus *Narcissus*, and the two terms may be used interchangeably. Jonquil, however, is properly employed only for one small group within the genus which includes *N. jonquilla*, several related species, and their hybrids. Call them all daffodils and you'll never be wrong.

Daffodils come in a surprising array of sizes, from half-inch-wide flowers on three-inch stems to five-inch flowers on

two-foot stems. Colors include yellow, white, orange and pink in various combinations.

The yellow trumpets as a group, the cyclamineus hybrids and some jonquil hybrids are all early bloomers. Poeticus hybrids bring the season to a close. By a judicious selection of varieties it is possible to have daffodils in bloom over a six-week period, and even longer in mild areas of the country where spring comes early.

Growing Them

Daffodil culture can be as easy or as complicated as you choose to make it. The serious showbench competitor will double

dig the beds, incorporate soil conditioners and balanced fertilizer and put the best soil under the bulbs. Bulbs for naturalizing, however, can be dropped in a hole dug with a mattock (a soil punch) and covered

with soil. The daffodil, tough bulb that it is, will grow in either case. But the better care you are willing to give your plants, the better blooms you can expect.

As a rule, the bulbs should be planted

Malak/Netherlands Flower-bulb Institute



Malak/Netherlands Flower-bulb Institute



Above left, a triandrus (three-flowered) daffodil, 'Thalia'. Above right, a double daffodil, 'Cheerfulness', has multiple flowers on each stem. Below *Narcissus poeticus* 'Actea' has a small, brilliant red-edged yellow eye, as do most of the poet's narcissus.

Gottschko-Schleisner





Above left, 'Rip Van Winkle', a miniature with very double blooms. Above right, 'Tête-à-Tête', another dwarf, and one that bears flowers in pairs. Below, one of the first of the pink-cupped daffodils, 'Mrs. R.O. Backhouse'.



be applied as a top dressing in spring or fall. Water seems to be *the* single most important factor in producing top quality bloom. During the bulbs' growing season—from autumn rooting until the foliage dies in late spring—an inch of rain a week is not too much. But please don't plant the bulbs where water stands for long periods. In a waterlogged soil the bulbs are likely to rot. Plant them where they will receive sunlight for at least part of the day. The dense shade beneath evergreens or on the north side of a building is not recommended.

The culture for miniatures is similar to that of the standard sized daffodils. However, because the tiny species daffodils, like many wildflowers, require special growing conditions, a novice gardener who likes miniature daffodils is advised to begin with hybrids such as 'Tête-à-Tête', 'Jumble', 'Sundial', 'Hawera', 'WeeBee' and 'Minnow', which are reliable as well as widely available.

Pink daffodils (pink cup, white perianth), once only a gleam in the hybridizers' eyes, are now a reality, and many excellent varieties are available. They include 'Mrs. R.O. Backhouse', a large-cupped narcissus with white petals and an apricot-pink cup. (Continued on p. 33)

about one spade's depth—six to eight inches (three to four inches for miniature bulbs). Large bulbs should be spaced six inches apart, small ones three inches apart. Superphosphate or the milder bone meal mixed in with the soil under the bulb will provide the necessary nutrients for the first year or two. If desired, an annual feeding of a balanced fertilizer low in nitrogen can

Bulbs in the Landscape

Right, dwarf iris, leucojum and
primrose with azalea. Below,
drifts of naturalized daffodils
line the bank of a lake.



Gottschalk-Schleier



Malak/Netherlands Flower-bulb Institute



All photos by Malak of Ottawa

A TRILOGY OF SPRING TULIPS

Opposite: Richer than a Persian carpet, Holland comes ablaze with the colors of its bulbs each spring. Right: Red Emperor Fosteriana tulips with large-trumpet yellow and white daffodils under a flowering cherry tree. Below: In the Keukenhof Gardens of Holland two varieties of Kaufmanniana tulips are separated by tiny blue Puschkinias.





Above left, hyacinths and grape-hyacinths (*Muscari*) with *Narcissus triandrus albus* (below) and *N. jonquilla simplex* (above). Below left, daffodils and poet's narcissus with lemon yellow broom and deep green evergreens. Above, blue-veined white puschkinias interplanted with *Praestans* 'Fusilier' tulips, a multiflowered variety.

Above left, hyacinths and grape-hyacinths (*Muscari*) with *Narcissus triandrus albus* (below) and *N. jonquilla simplex* (above). Below left, daffodils and poet's narcissus with lemon yellow broom and deep green evergreens. Above, blue-veined white puschkinias interplanted with *Praestans* 'Fusilier' tulips, a multiflowered variety.

Not Many Problems

Daffodils are relatively disease- and pest-free. Viruses, characterized by yellow or white striping on the foliage, are noted occasionally. There is no known cure; the best protection is to dig and discard diseased plants. Basal rot is a problem in warm climates. As a preventive measure, bulbs may be dipped in a Benlate solution before planting. Once infected, there is no cure; but a particularly choice bulb may be salvaged by cutting away all rotted tissue and dusting the cut surfaces with Benlate.

The only other major pest is the narcissus bulb fly, which lays its eggs in late spring at the base of the foliage. The larva tunnels down to the base of the bulb, enters through the basal plate and eats the interior of the bulb. It then spends the winter in a pupal state and emerges the following spring. The U.S. Department of Agriculture recommends using Dylox R as a soil drench in spring at the onset of fly activity. Fortunately, most of us will never see any of these pests.

Adaptability and Uses

Some daffodils will grow almost anywhere in this country, but not all daffodils will grow everywhere. Tazetta hybrids, which have two to four flowers to a stem and are sweetly scented, are well suited for the

South but won't survive severe winters in the North. *N. jonquilla*, another daffodil with a number of multiflowering varieties, is common in the South but "iffy" in areas where winters drop consistently below freezing. Its hybrids, however, are usually quite hardy in the North. *N. poeticus*, daffodils with small cups edged in red, are native to alpine meadows of Europe, and its hybrids usually thrive best in a cool climate.

Daffodils may be planted in clumps in the perennial border and between shrubs, naturalized in fields or open woods, in fact, anywhere a breath of spring is wanted. Choose an early-blooming variety and plant it where its earliness can be appreciated—perhaps to greet visitors at your front door. Plant daffodil bulbs any way you choose, except in straight lines like a row of soldiers at attention. Wherever they are planted, the foliage should be allowed to ripen naturally for a minimum of six weeks after flowering. Please—no braiding, no tying, and above all no cutting off of untidy leaves. If the foliage can't be tolerated in a particular spot, choose another spot for planting.

One last note on landscaping with daffodils—avoid mixing varieties in a clump. A more pleasing effect can be obtained by planting three to a dozen bulbs each of contrasting varieties and dividing them only when necessary, usually after four to six years. ❀

CROCUS "T"

There is bloom outdoors twelve months a year at the Brooklyn Botanic Garden, though the pickings can be lean at New Year's. The first bulb to flower is a little species crocus from Yugoslavia, *Crocus tomasinianus*, which was planted originally on the west side of the grounds in the 1920s. It has made itself thoroughly at home, spreading by seed and corm at a pace faster than hungry squirrels can keep up with. Call it Crocus "T" for short.

Crocus "T" begins to flower in late January some years, February or March in others, depending on the severity of the winter. Like most winter bulbs it blooms a lengthy time, a month or five weeks, and the small flowers, which appear in various shades of lavender, seem immune to deep freezes. As with all crocuses they close on cloudy days, and fertilization occurs underground, which makes eminent good sense for a winter bloomer. In time, bulbs form large drifts—a meadow garden in midwinter. Corms cost a pittance. Crocus "T" is the best crocus for naturalizing, so why not plant them in numbers? ❀



Tulip 'Crown Imperial'

The development of ...

MODERN TULIPS

Adrian Frylink

In 1885 a collection of tulips consisting of some ten thousand bulbs in almost three thousand varieties was offered for sale by an amateur grower in Flanders. It was an entirely new, vigorous strain with clear, bright colors and strong, tall stems. Mr. Krelage, one of the leading Dutch growers of his time, acquired the collection and brought it to his nurseries in the city of Haarlem, The Netherlands. In honor of the

great scientist Charles Darwin, he asked and received permission from Mr. Darwin's son to name the new strain Darwin tulips. It is a matter of history that the introduction of the Darwin tulip did more than anything else to bring tulips to the prominent position in gardening they hold today.

A century ago comparatively few tulips were forced in greenhouses for use as cut

flowers or potted plants during winter months. The long-stemmed tulips we see all winter in the flower shops were unheard of then. But the introduction of the Darwin tulips changed that. It was found that several varieties could be forced into bloom as early as February, with stems twice as long as the early tulips. In addition, the Darwins proved to be excellent parents. They have been crossed with other cultivated strains, as well as with wild tulips to form new tulip classes.

Breeding

Hybridizing tulips is a monumental task, taking huge amounts of time, patience and money. After the prospective seed and pollen varieties have been selected, the seed plant is pollinated. Each cross is numbered and a careful record of the parent varieties is kept. The seed is collected when ripe, about two months after fertilization.

In September the seeds are planted and labeled. The following spring they will show one tiny leaflet—no flowers. By the time they are harvested in June, they will have formed tiny bulblets the size of a pea

or small marble. Each fall the tiny bulbs are planted, and each summer they are harvested. After four to seven years the first blooms appear. Out of the thousands of seedlings only a few are selected for further testing. A high score on color, substance, shape, stem and foliage is important, but there are other considerations. Does the new seedling propagate rapidly? Is it immune or resistant to diseases? Does it respond favorably to modern curing processes? Does it force early and easily? Is the outer bulb skin strong enough to withstand mechanical planting, harvesting and grading?

Tulips are slow propagators. At best the bulbs will double in quantity each year. It will take another ten to twelve years from the time a small bulb produces its first flower until there are one thousand bulbs.

At this time a permanent name for the seedling is proposed to the Registration Committee of the Royal Bulbgrowers' Society in Holland, and a sample of bulbs is planted in the trial garden of the Society, where the official characteristics and measurements are taken. A color description is drawn up, using as the standard the color



'Heart's Delight', a variety of the early-blooming species tulip *Tulipa kaufmanniana*. Often just six to eight inches high, the species tulips naturalize easily.

chart of the Royal Horticultural Society of London.

During the ensuing years the new variety may be entered in the weekly competitions of the Royal Bulbgrowers' Society to be judged for an Award of Merit, a Forcing Award or the much coveted and rarely granted First Class Certificate. Finally, some twenty to twenty-five or more years after the original cross was made, the new tulip will be introduced in limited quantities to gardeners all over the world.

Types

The International Register of Tulip Names divides the garden tulip into fifteen distinct groups. For practical reasons I have condensed these classifications and have grouped tulips according to their blooming time in my garden on Long Island's South Shore.

Right after the last Dutch crocuses are gone and before the first daffodils show color, I look forward to *Tulipa pulchella* 'Violacea', *T. kaufmanniana* and *T. tarda*. Perfectly hardy, from 4 to 6 inches in height, they have thrived for years in the same spot in a well-drained raised bed.

Tulipa kaufmanniana has produced numerous hybrids, some with foliage mottled olive-brown. They are especially good for borders and rock gardens. 'Fritz Kreisler', 'Gaiety' and 'Vivaldi' are outstanding.

Following the Kaufmannianas comes the dazzling scarlet *Tulipa greigii*, generally standing 12 to 14 inches and displaying curious olive-brown markings on the leaves. For the rock garden and border I like 'Golden Day', 'Majestic' and the tall 'Oriental Splendour'.

Single early tulips are said to be among the strains brought to Western Europe from Turkey more than four hundred years ago. From 12 to 14 inches in height and much improved during the last century, they combine well with hyacinths and narcissi in mixed borders. I enjoy 'General de Wet' for its heady fragrance; 'Couleur Cardinal' and the old stand-by 'Keizerskroon' are superb.

Double early tulips are also mentioned in the old herbals. They combine well with single early tulips and look fine in flower beds. When I was a small boy in Holland, my father pointed out that by investing in

a new tulip I could earn more on my savings than the 2.64 percent that Postal Savings was paying. Following his advice, I bought a few kilograms of the then-newly-introduced 'Mr. Van der Hoef' from our neighbor. The investment paid off well, and now, after seventy years, it is still magnificent and one of my favorites, as are 'Peach Blossom' and 'Orange-Nassau'.

Many varieties of *Tulipa fosteriana* have had one wild tulip for a parent. Best known is 'Red Emperor'. Other well-known and excellent Fosterianas are 'White Emperor' and 'Yellow Empress'. Taller than the single and double earlies, they are fine subjects for the early spring border in combination with other bulbs.

As the season advances, three intermediate groups come into bloom. Known as Mendel, Triumph and Darwin Hybrid tulips, they all have a Darwin as one of their parents.

Mendel tulips are tall with large flowers and are good for forcing. An unusual shade for the mid-season border is 'Apricot Beauty'.

Triumph tulips have large, boldly-colored flowers and somewhat shorter, but sturdier, stems than the Darwins. Many are used for forcing, and their wide color range makes them excellent subjects for beds and borders. 'Donatello', 'Stromboli' and 'Affective' are some of the best.

Darwin Hybrid tulips combine the graceful tall stems of the Darwins with the vigor of its "wild" Fosteriana parent. Red was the predominant shade of the first Darwin Hybrids, but subsequent crosses brought out a gamut of colors. Among them are selections made in Holland by my father from crosses between an unnamed Darwin Hybrid and single early tulip 'Couleur Cardinal'. 'Big Chief' (Award of Merit and First Class Certificate), 'Aflame' (Award of Merit) and 'Orange Goblet' (Award of Merit, Trial Garden Award and First Class Certificate) are truly outstanding. Among the older varieties are 'Apeldoorn' and its sports 'Golden Apeldoorn' and 'Striped Apeldoorn'.

Darwin tulips are still of great importance. Some of the original seedlings brought from Flanders and subsequently named nearly a century ago are still in cultivation. Hybridization has improved their



range of colors, and they are easily recognized as Darwins by the rectangular outline of the lower part of the flower. Typical are 'Aristocrat', 'Flying Dutchman' and 'Pink Supreme'.

Lily-flowered tulips have the pointed, reflexed petals of one parent, *Tulipa retroflexa*, and the strong stems of their other parent, the Darwins. 'Maybole', 'Red Shine' and 'Ascona' are fine in borders and as cut flowers.

Old herbals describe parrot tulips as having short stems, too weak to carry the large, deeply cut flowers. It was not until 1910 that an important parrot appeared unexpectedly in a lot of Darwin tulips. Identical ones were found during the next few years by other growers. It has a strong stem, enormous flowers and is aptly named 'Fantasy'. It is still one of the best parrot tulips, as are 'Texas Gold' and 'Blue Parrot'.

Equal to their Darwin parents in height and vigor, fringed tulips have a crystallike fringe at the edge of the petals and make a valuable addition to the border or as cut flowers. 'Swan Wings', 'Fringed Lilac' and 'Burgundy Lace' are some of the best in this group.

Above, a lily-flowered tulip, 'West Point'. Below, 'Texas Gold', a shaggy-edged multicolored parrot type.



Chameleon tulips, also of Darwin parentage, are ideal for a terrace border where one may closely observe their color changes as they develop from day to day. They open milky-white with faint speckles and a delicate margin of rose, pink or violet-blue, which spreads over the entire flower as it ages. Try 'Ossi Oswaldi', 'Magier' and 'Makeup'.

Cottage tulips originated centuries ago in England, where amateurs raised them in gardens around their cottages. Their principal characteristic is the oval outline of the flower. Modern hybridization has brought vigor and more colors, such as the red and yellow 'San Marino', one of the longest lasting tulips in the garden.

Rembrandt tulips are striped in brown, bronze, black, red, pink or purple on red, white or yellow petals. At one time they were in great demand and prized above the solid-colored blooms. Scientific research



A late double or peony-flowered tulip. Their heavy heads require a protected location.

Herman Guttner



Round-based cottage tulips with a flat-based Darwin in back.

found the stripes and marks of the Rembrandts were caused by a virus which was transmitted by aphids. Plants affected by this virus are called "breakers." The virus not only affects the color of the flower, but also impairs the vigor and productivity of the plant. Since the virus can be transmitted to other tulips, I no longer grow Rembrandts in my garden.

Crosses between cottage tulips and *Tulipa viridiflora* have given us the green tulips. The colors of the cottage parents, subdued by shadings and edgings of green, together with their elegant shapes and graceful stems, make them excellent subjects for artistic flower arrangements. I like 'Greenland', 'Court Lady' and 'Angel'.

Multi-flowered tulips bear from three to five flowers on each stem. In small groups 'Red Bouquet', 'Wallflower' and 'Rose Mist' add much to a border planting.

Peony-flowered tulips often appear in old paintings. Each flower has two rows of petals and resembles a peony. They are magnificent for borders and bedding. 'Eros', 'Mount Tacoma' and 'Symphonia' are three of the best.

The oldest tulip in cultivation, dating back to 1620, is the salmon-pink and white 'Zomerschoon'. One of my favorite combinations is this medium-sized beauty rising out of a cloud of Jacob's-ladder (*Polomonium caeruleum*). ❀



An old engraving of *Tulipa semper augustus*, showing tulip "breaking." This tulip was one of the culprits in "Tulipomania." *Malak/Netherlands Flower-bulb Institute*

Among the famous fads of history . . .

THE STORY OF TULIPOMANIA

Elizabeth C. Hall

Tulips were practically unknown to the gardeners of western Europe until the latter part of the sixteenth century. Ogier Ghislain de Busbecq, who was ambassador from the Holy Roman Emperor, Ferdinand I, to Suleiman the Magnificent, Sultan of the Ottoman Empire, wrote a letter describing his trip in 1554 from Adrianople to Constantinople. He recorded that he had seen "an abundance of flowers everywhere—narcissus, hyacinths, and those which the Turks call *tulipam*—much to our astonishment, because it was almost mid-winter, a season unfriendly to flowers. Greece abounds in narcissus and hyacinths remarkable for their fragrance, which is so strong as to hurt those not used to it; the *tulipam*, however, have little or no smell, but are admired for the beauty and variety of their colours. The Turks pay great attention to the cultivation of flowers, and do not hesitate to pay several aspers for one that is beautiful. I received several

presents of these flowers, which cost me not a little."

Busbecq brought back to Vienna seeds and probably bulbs, and by 1559 tulips were growing in his garden. German naturalist Konrad Gesner wrote that he saw a tulip "growing with a single, large, red-dish flower, like a red lily, with a pleasant smell, soothing and delicate, which soon leaves it." By 1562 a cargo of bulbs from Constantinople was received by a merchant in Antwerp. From Flanders the tulip journeyed to Holland and about fifteen years later it was being grown in England.

Clusius, professor of botany at the University of Leiden, in the town of the same name which in years to come would mark the southern border of Holland's flower bulb district, wrote several books with considerable information on the identification and culture of tulips. In his *Rariorum Plantarum Historia* (1601), the first monograph on tulips, he stated that in 1573

Busbecq sent him tulip seed. "However, it was old and shrivelled and I hardly thought it would germinate. I did not sow it until 1575. Yet an enormous number of tulips have originated from this seed, and several of these have, in the fifth, sixth and also in the following years, borne flowers recommended for the considerable variety of their colours. For among early tulips I have obtained yellow, red, white and purple-selves, and above all flowers distinguished by these colours being intermixed, and thus belonging in the variegated yellows, whites and purples." These observations on the intermixing of variegated colors are the earliest records of that curious phenomenon now known as "breaking" of tulips, in which a virus infects the bulb underground and causes it to produce "breakers" or "sports." They have flowers with fantastic stripes and streaks totally different from those borne the spring before.

Clusius, excellent gardener and author that he was, became known as a shrewd businessman. It was said that he charged such an exorbitant price for his tulips that no one could procure them. As a result, most of his best plants were stolen, and he lost courage and the zest to continue growing them.

However, there were many other enthusiastic tulip entrepreneurs besides Clusius. The popularity of the bulbs, especially in the Netherlands, grew into a spectacular hysteria which became known as "Tulipomania,"—or as the Dutch called it, *Tulipenwindhandel*. This mania overtook not only the commercial nurserymen but all classes of humanity. Aristocratic noblemen were known to pay up to 100,000 florins for a single bulb, and Hollanders with only a few square yards of garden to call their own became "investors" in this gambling boom. Houses were mortgaged. Commodities such as horses, pigs, sheep, hogsheads of wine, barrels of cheese and butter were freely bartered. There were endless opportunities for fraud. From the appearance of the bulb itself it was impossible to identify its variety and the color of flower it was "guaranteed" to produce. Many lawsuits flooded the courts. Soon everyone wanted to sell—no one to buy. The madness ended with the "crash" of

1637, almost ruining the mighty Dutch economy in the process. Finally the Dutch government intervened with controlling legislation, issuing a decree that forbade speculation in tulip bulbs.

Across the North Sea from Holland, the English were not wholly immune to the tulip craze. There was frequent vying among enthusiastic plantsmen to be the first to possess an outstanding novelty tulip. It was said that the ridicule coming from the pens of such literary men as Addison served as a stabile for the overzealous and overexcited.

From the *Tatler* of 1710 we read: "As I sat in the porch, I heard the voices of two or three persons, who seemed very earnest in discourse. My curiosity was raised when I heard the names of Alexander the Great and Artaxerxes . . . I was surprised to hear one say, that he valued the Black Prince more than the Duke of Vendome. . . . He added that though the season was so changeable, the Duke of Marlborough was in blooming beauty. . . . To which they added, what I entirely agreed with them in, that the Crown of France was very weak, but that the Marshall Villars still kept his colours. . . . At least, one of them told the company, that if they would go along with him, he would show them a Chimney-Sweeper and a Painted Lady in the same bed. . . . I asked them to let me be one of their company." Of course, the conversation was about varieties of tulips.

Early in the eighteenth century Turkey experienced a mild recurrence of tulip frenzy, but it never degenerated into a financial fiasco like that which occurred in Holland. It was recorded that at one time a single bulb from Persia brought a price of a thousand gold pieces and it was reported that the palace garden in Constantinople contained over a million blooms of 1300 different varieties.

The cult of the tulip still persists in our twentieth century. Tulip shows are held here in America and abroad with fierce competition for coveted awards. A moderate quantity of bulbs is produced in England, America and elsewhere but the Hollanders still continue to retain supremacy in breeding and propagating varieties of the highest excellence. ❧



Enchantment lilies

Leading ladies of the garden . . .

LILIES FOR THE HOME GARDEN

Jan de Graaff

Just thirty years ago, in my book entitled *The New Book of Lilies*, I wrote: "Lilies are easy to grow. Given the same common-sense care bestowed upon other flowers, they outshine them all in beauty, grace and charm. They are the leading ladies of the garden." I see no reason to change this encomium. Since then, the development of garden lilies in our country has been so phenomenal that my praise of those earlier days has been more than confirmed.

There are many plants called "lilies" that are not, botanically speaking, lilies at all. Daylilies, calla-lilies and lilies-of-the-

valley are but three of perhaps a hundred lovely plants, called "lilies," with attractive flowers and foliage, that do not belong to the genus *Lilium*. What then is a true Lily?

Liberty Hyde Bailey, our great American botanist, in his *Standard Cyclopaedia of Horticulture*, gives us the best definition I have found. He states that a lily is a perennial, erect, leafy-stemmed herb, with an underground scale bulb; flowers pendulous, inclined, horizontal or erect, solitary or clustered; with six separate segments which are scarcely differentiated as

between petal-like and sepal-like organs, each bearing a nectar groove or furrow at the base; stamens six.

The true wild lilies, the species, are found in a broad circle around the North Pole. Thus they grow in China and Japan, in the Soviet Union and in many European countries, as well as in the United States and, in the Philippines, on the island of Luzon. The white Madonna lily (*L. candidum*) is native to the eastern Mediterranean countries and the Balkans. It is probably the best-known and the best-loved of all lilies. Hardly a cottage garden in Europe can be found without clumps of this pure white-flowering lily, usually contrasting elegantly with some deep blue delphinium.

The species, of which there are more than a hundred, are without exception beautiful. Some of them, such as *L. canadense*, have an elegance, a perfection of form, that can hardly be rivalled in any other garden plant. Yet, however desirable the real wild species lilies might be, we must realize that each one thriving in its natural habitat has just those ideal condi-

tions of climate and soil that it needs for optimum growth. If you collect such bulbs and transplant them to your garden, where they will meet different conditions, most of them, even with the most careful treatment, may not survive the move.

What then are the conditions garden lilies need? We can generalize and say that the foremost need is for a soil that is well drained but not wet, holds moisture and is slightly acid. A garden with a good stand of azaleas and rhododendrons will usually be a good haven for lilies. It must always be remembered that a lily never sleeps. It is already developing new roots even when the foliage is dying down at summer's end. Sunlight, a constant flow of clean air and, again, perfect drainage are essential to its growth. A slope is always to be preferred over a flat area; a hilled-up bed over a low-lying herbaceous border. Autumn planting is commonly practiced, though in colder parts of the country early spring is preferable.

To grow the species, it is better to get a fresh start from seed, available from several lily specialists and from the annual



White Japanese lilies (*Lilium speciosum* 'Album'), a turk's-cap type with extremely reflexed petals.



The Olympic Hybrid 'Pink Perfection', a trumpet-type lily, blooms in June with purplish buds fading on opening.

free distribution of seed collected by members of the North American Lily Society. (For particulars on membership, write The North American Lily Society, Mr. Earl A. Holl, Treasurer, Box 40134, Indianapolis, IN 46240.) Species bulbs, grown in the garden from such seed, are more likely to survive than collected bulbs, which cannot fail to have lost some vigor from being harvested and shipped.

Better Lilies Today

Luckily, the gardener does not have to depend on the species which, at best, may have but a feeble toehold on life. During the past thirty years we have seen a development of sturdy, vigorous and dependable hybrid lilies which outperform in almost all respects even the most beautiful species.

The reason for this superior performance is not hard to find. Each species is what one might call adjusted to the conditions prevailing in its natural habitat. Cross it with another species which thrives under different conditions, and the result-

ing hybrids will have inherited some characteristics from each parent species. Some of these progeny may have a greater tolerance and more adaptability to conditions in the home garden.

The hybrid lily 'Enchantment' has among its ancestors the true tiger lily (*L. lancifolium*) from the Orient and some of the upright-flowering European lilies. It has hybrid vigor and therefore tolerance to a variety of soils and climate. Taking the garden world by storm, 'Enchantment' soon was joined by a beautiful golden yellow, upright-flowering hybrid: 'Connecticut King'. And then, hybridizers in many countries introduced new colors in lilies of similar type. The colors were derived from *L. cernuum*, a small Korean lily which has purplish-pink nodding flowers.

Other Hybrids

Dr. David Griffiths, dean of American lily breeders, introduced some magnificent hybrids which, under the name of Bellingham Hybrids, represented the full range of color and form found in the Western

United States species, plus hybrid vigor and a tolerance to whatever problems the home garden might offer.

Mrs. R.O. Backhouse, of daffodil fame, raised some lovely hybrids using the European *L. martagon* crossed with a lily from Korea, *L. hansonii*, to raise a strain that eventually was sold as "Backhouse Hybrids" or "Paisley Hybrids"—lilies in all the colors of the lovely old paisley shawls.

Then, some seventy years ago, E.H. Wilson, the well-known collector who traveled widely in China, discovered many wonderful plants new to horticulture and introduced the regal lily (*L. regale*) to the American garden scene. And with this introduction a new selection of magnificent hybrids came into being. The regal lily, crossed with other trumpet lily species, produced a series of magnificent hybrids which, under the descriptive names of Olympic, Green Mountain and Black Dragon strains, became a worthwhile addition to our garden lilies. These hybrids, again crossed with a golden yellow lily with reflexed petals (*L. henryi*) produced offspring with pure white, deep golden yellow and, eventually, pink to light purple trumpet-shaped flowers.

L. henryi's reflexed flowers also contributed characteristics of the parent, and vigorous large hybrids of white flowers with orange hearts, or in the curious colors of lilac and yellow, came into being.

But the most spectacular new hybrid lilies for the garden today can be found in the hybrids of four Japanese species; *L. auratum*, *L. speciosum*, *L. japonicum* and *L. rubellum*. The resulting majestic plants, are, given reasonable care, hardy in most gardens. They have been joined in recent years by dwarf forms, which make good pot plants for house decoration and offer an interesting alternative to the ubiquitous Easter lilies.

No garden plant exists, I believe, without some diseases and pests affecting it at some stage of its development. For lilies a combination of virus diseases, transmitted by aphids, are the most dangerous. These appear as striping or mottling of leaves or flowers and severely weaken the plants. The best summary of all the diseases that may affect lilies, and their control, was written by the late Professor George L. Slate and is available from the North American Lily Society. The gloomy view expressed by Dr. Slate some ten years ago has been modified by recent research and the availability of new pest and disease controls as well as by the inherent vigor and disease resistance of the newer garden hybrids. The North American Lily Society also has a complete booklet discussing the growing of lilies from seed. For the beginning lily gardener the illustrated handbook of lily culture, entitled *Let's Grow Lilies*, with the inimitable drawings of Virginia Howie, is a "must." ❀

Hold That Tiger

When is it better *not* to receive a gift? When a friend generously offers you some starter plants of tiger lily (*Lilium lancifolium*, formerly *L. tigrinum*), and you are already growing other kinds. Reason: tiger lily is a notable virus carrier, a Typhoid Mary of lilydom, so to speak. It is a beautiful midsummer bloomer from Asia, and the nodding Turk's-cap sort of flowers are to be found in many oldtime gardens. Plants themselves are vigorous despite the virus, but other lilies they infect eventually lose the battle. Propagation is easy from bulbs or from bulbils found in the leaf axils along the stem, so there is a temptation to pass extras along to fellow gardeners. Instead, make a gourmet meal of the bulbs if you feel imaginative—the Japanese have eaten them for centuries.

'Enchantment', which has an upright orange flower, is derived in part from the tiger lily but is not the disease transmitter its well-known parent is. Gold-band lily (*L. auratum*), it should be mentioned, is another transmitter. No cause to worry. There are plenty of other good lilies to grow. ❀



Yellow-flowered *Allium moly*

Yes, there are ornamental ones, too . . .

KNOWING YOUR ONIONS

James Fanning

All onions are alliums, but not all alliums are onions—far from it. The genus *Allium* includes not only onions, leeks and garlic, but several hundred species that grow wild in the north temperate zone, notably the United States and Central Asia. Botanists argue over the classification of the genus.

For a long time it was placed in the Lily Family, but the most authoritative present-day botanists assign it to the Amaryllis Family. Be that as it may, gardeners of every persuasion can find alliums to fill important places in their gardens. Apart from those grown only for food—all of

Allium christophii has flower heads up to 12 inches across in a lilac tint. They are good for dried arrangements.

which, incidentally, have handsome flowers—there are alliums that fill important places in perennial borders, rock gardens, wildflower gardens and the greenhouse.

Culture

Alliums are easy to grow. Most of them like a sandy, well-drained soil, full sun and a dry summer. A few however, like *A. tri-coccum* in the United States and *A. ursinum* in Europe, thrive in damp, shady woods. Some, like chives (*A. schoenoprasum*), are practically evergreen, but most of the large-flowered kinds have leaves that disappear shortly after flowering. Most are winter hardy as far north as Canada, but tender species, such as *A. neapolitanum*, are very satisfactory when grown in greenhouse benches or in pots on a windowsill. Alliums in general have very few pests. Spittle bugs seem to like chives, while thrips and nematodes sometimes attack commercial crops of onions, but none of these is a serious threat to plants grown in small numbers in a home garden. They are easy to propagate, too, by simply separating bulbs or splitting up clumps after flowering. It's a good idea to remove seed heads before they mature, to prevent seedlings springing up where they are not wanted.

Highly Recommended

The following list is arranged according to time of flowering in the New York City area. It is only a small selection of the great variety to be found in the genus *Allium*:

A. zebdanense. Flowering at the same time as the late daffodils, this has small clusters of glistening white flowers atop slender, foot-high stems among grasslike, light green leaves. Bulbs multiply by means of offsets, and the foliage disappears in June, so summer-flowering annuals may be planted over them.

A. moly. This is one of the few yellow-



Mada/Netherlands Flower-bulb Institute

flowered alliums. The leaves are shaped like those of miniature tulips, and are very late to appear in the spring, with flowers opening in late May, three or four in a cluster, and bright golden yellow, on six to eight inch stalks. *Moly* is particularly attractive when grown among a low ground cover, such as creeping thyme.

A. rosenbachianum. Perhaps best of the large-flowered alliums, with lavender-pink flowers in a spherical head about three inches across, on a three to four foot stem in late May. Bluish-green leaves are broad and glossy, disappearing in early June. An excellent species for cutting, particularly for drying.

A. oreophilum (ostroskyanum). Flowering in late May, this one has lavender-pink flowers in golf ball-sized clusters on six to eight inch stems. Leaves are blue-green and grasslike, disappearing soon after flowering.

A. karataviense. Very handsome leaves, broad, velvety deep green with lighter markings. Each leaf rosette sends up a flower head about ten inches high with a two to three inch cluster of pinkish-white



Allium aflatanense is quite similar to *A. giganteum* but somewhat smaller. The leaves are broad and strap-shaped.

flowers in early June. Flower stalks tend to bend and twist in odd ways, but it's still a good one for drying. Leaves disappear soon after flowering.

A. christophii (*albopilosum*). Leaves are one foot or more long, one inch wide, and hairy on the undersides. Each bulb sends up a single heavy flower stalk to a height of up to two feet, with a large—up to ten inches in diameter—spherical flower cluster at the top. Individual flowers are star-shaped, with pointed petals about one inch across, and a metallic violet-blue in color. Leaves disappear as the flowers open, in early June. Allowed to mature and dry on the plant, the flower stalks may be

pulled out of the ground without harming the bulb, and are simply magnificent for dried arrangements. Bulbs do not form clumps, and height and size of flowers are extremely variable.

A. unifolium. A native of California that, in spite of its name, has several grasslike leaves. Flowers are soft pink, in a loose umbel atop an eight to ten inch stalk in early June. The leaves disappear soon after flowering.

A. giganteum. Perhaps the most commonly grown of the flowering alliums. Flowers are four to six inch spheres of tightly-packed lavender flowers on stalks three to four feet high. Leaves are 12 to



The sprightly pale lilac flowers of common garden chives (*A. schoenoprasum*) contrast nicely with their abundant glaucous-green leaves.

18 inches long and two inches broad, bright green and smooth, disappearing at flowering time. Because the flower heads are so densely packed, stems of the individual flowers are slender and weak, and easily damaged by rain. For the same reason, they do not dry well, but can be spectacular as fresh cut flowers.

A. narcissiflorum. One of the smaller alliums, this is suitable for planting in a rock garden. Leaves are grasslike, less than a foot high, and persistent. Flowers appear in early summer, on stalks a bit taller than the leaves, in a nodding cluster of two or three. They are bell-shaped, bright rose in color, and look somewhat like tiny daffodils. Not reliably hardy in the north.

A. cernuum. Clumps of bluish-green daffodillike leaves send up 18-inch flower stalks in early summer, with cameo-pink flowers in a loose cluster that faces downward and resembles a parasol. Leaves stay green for most of the summer. This allium is supposed to have provided food for the Lewis and Clark expedition, but nowadays we find it too beautiful to eat.

A. cyathophorum farrerii. A gem for the

rock garden, forming tight clumps of grasslike leaves with four-to-six inch flower stalks in June. Flower heads nod gracefully, like tassels of raspberry-purple. The leaves stay green all summer, and clumps may be broken up to make new plants at any time.

A. pulchellum. The specific name means beautiful, and very appropriate it is for the shaggy heads of bright pink flowers that appear in July. The blue-green leaves are long and slender, arch gracefully, and remain throughout the summer. Flower stalks reach about two feet, but seem taller because the spathe surrounding each flower cluster has an extremely long point. There is a white-flowered variety, and *Allium flavum* is so similar except for its distinctly glaucous foliage that it might be called a yellow-flowered variety of *pulchellum*.

A. senescens. This fine species has so many varieties that a whole garden might be planted with nothing else. Some form dense, creeping mats three or four inches high, while others grow as upright, tight clumps of fleshy leaves. In all the varieties, the narrow straplike leaves, which normally have a slight twist, appear in early spring and stay green well into the fall. Flowers are coral pink, in domed heads one or two inches across, on stems that hold them well above the leaves. Flowering time seems to depend on height, with low-growing varieties beginning to bloom in late June, followed by taller ones that go right on through the summer. The variety usually cataloged as *glaucum* has bluish-green leaves in a dense mat that makes a fine groundcover in a sunny, well-drained location.

A. tuberosum. Sometimes called oriental garlic or garlic chives, this grows as a dense clump of fleshy, bright green, flattened leaves. Flowers are borne on stalks about 18 inches high in late summer. They are snowy white, in a dense cluster, and last for several weeks. Leaves of this species are used like chives.

Take warning: Bulb dealers are very often confused about allium species. Varieties of *A. senescens*, for example, may be listed as distinct species. They're all worth growing, however, and tracking down the true identification of a species can be very interesting. ❧



Narcissus triandrus 'April Tears'

Choose carefully from the list of miniature bulbs when...

Using Bulbs in the Rock Garden

Marnie Flook

In a rock garden, bulbs can add interesting foliage, graceful flowers and a restrained habit of growth to the tufted or creeping plants that we normally expect to find there. However, many of the bulbs described so appealingly in catalogs spread quickly, seed themselves profusely or have large leaves that become unsightly as they mature and die, so do not really belong among rock plants. Then, too, some of the bulb species need a drying-out during the summer, and do not take kindly to the watering that is often necessary to keep other rock plants alive.

There are still, however, many lovely and appropriate bulbs suitable for the rock garden. These are the so-called "little" bulbs, best seen close up. The elevated parts of a rock garden are where they are shown to best advantage. Most of these "little" bulbs are very early or very late to flower, often at times when there is little else in bloom, and they have inconspicuous leaves that wither and die quite unobtrusively.

Anemone blanda var. *atrocaerulea* is an early bloomer with deep blue, daisylike flowers and low, fernlike, dark green



Grape-hyacinth (*Muscari*) can be grown as a ground cover or spotted in small clumps in a rock garden. They tend to jump about but seldom intrusively.

leaves. It combines particularly well with the dwarf *Hosta venusta* which flowers later in the season. *Scilla tubergeniana* is another of the early-flowering bulbs, with spikes of pale blue flowers that start to open as soon as they push through the ground.

It is the narcissus—call them daffodils if you like—that are the real gems of early spring. *Narcissus asturiensis* (*minimus*) is a perfect little golden trumpet daffodil on a 3-inch stem. *N. rupicola*, 6 inches high with deep yellow flowers and rushlike leaves, and *N. triandrus albus*, also 6 inches high with creamy-white flowers, are also among the best. Few of the hybrid narcissus seem to look right in a rock garden, but 'Bobbysoxer', 'Minnow' and 'Sundial' are all lovely. My favorites are 'Wee Bee', a 4-inch-high variety of *asturiensis*, and 'Hawera', a long-lasting pale yellow on 6-inch stems that looks particularly nice behind the golden yellow flowers of *Potentilla verna nana*.

The most satisfactory species tulip I have grown is *Tulipa tarda*, with its bunches of 4- to 6-inch starry yellow flowers blooming after the daffodils. Other good ones include *T. biflora*, with tiny

white and yellow flowers; *T. kolpakowskiana*, red-striped yellow and 6 inches high; *T. orphanidea*, 8 to 10 inches high and bronzy-yellow; *T. patens* (*celsiana* or *persica*), 4 to 6 inches high, with red and yellow flowers and oddly curled leaves; *T. pulchella* 'Violacea', very early, 4 inches tall and bright purple and *T. praestans*, with its many bright-colored varieties. They are all suitable for dry, sunny spots. The alliums (flowering onions) have grassy foliage and flower from midspring right through the summer. Two that I've grown from seed are *Allium cyaneum* and *A. sik-kimensis*, both with blue flowers 6 to 10 inches tall and neat foliage. *A. senescens glaucum* has low-growing, twisted gray-green leaves which are as interesting as the mauve flowers that appear in late summer. Louise Beebe Wilder suggests planting this near *Sedum sieboldii* for a spectacular effect.

Muscari botryoides, the grape-hyacinth and its varieties, is an early spring bloomer at home anywhere, perhaps best planted under shrubs. For woody soil and shady spots, the many varieties of *Erythronium*, the dogtooth violet, are reliable performers in different parts of the country. Although

the crown imperial (*Fritillaria imperialis*) is too tall for most rock gardens, other fritillarias, such as *F. meleagris*, the guinea-hen flower, have a delicate charm that goes well with rock plants.

Cyclamens are favorites of most rock gardeners. The beautifully patterned dark green, heart-shaped leaves are almost evergreen, making them useful as ground cover in a lightly shaded area. The bulbs, technically corms, should be planted no more than 3 or 4 inches deep in woody soil that never becomes completely dry. *Cyclamen purpurascens* (*europaeum*) has deep carmine flowers in late summer. *C.*

hederifolium (*neapolitanum*) has pink or white flowers in the fall.

In a rock garden, bulbs in general should be planted at a depth of about three times their own size, in a well-drained mixture of peat moss, loam and coarse sand. Against the southern face of a rock the early bloomers will flower before they would in any other location. Since most of them like to be dry during the summer, they should not be planted close to plants that require summer watering. No matter which you choose, bulbs can provide important and colorful accents in every well-managed rock garden. ❧

Unsung Natives

Most of the bulbs we plant come from other lands, but there are some native Americans that have a place as well, though they are not generally as conspicuous in bloom as daffodils and tulips. Nearly every eastern wildflower gardener knows the trout-lily or dogtooth-violet (*Erythronium americanum*), a woodlander with fleeting, brown-spotted leaves and usually sparse, nodding, small yellow flowers in spring. The real winners are the western erythroniums with chunky yellow, white or pinkish blossoms, resembling true lilies in miniature except for the foliage. Seek out *E. tuolumnense* (bright yellow) and *E. californicum* (white to cream), among others. Give them woody soil and light shade.

Also from the West, mainly from California and Oregon, are the brodiaeas, which demand sun and dry, gravelly soil in the East. Don't count on them being hardy much north of New York City. *Brodiaea* 'Queen Fabiola', with violet bell-shaped flowers, is worth a try, but mulch it with salt hay in winter. Mariposa-lilies (*Calochortus* spp.), also from the West, are attractive but are mainly for the rock garden specialist because of their exacting culture and generally short life.

Camassias are hefty growers, usually 2 to 3 feet tall in bloom, and they can hold their own in a late spring perennial border. Flowers are star-shaped, moderately showy. *Camassia cusickii* and *C. leichtlinii* are similar, light or dark blue, sometimes white. *C. quamash* (*esculenta*) is usually deeper in flower color. The paler shades are valuable in color schemes, complementing anything but a delphinium. All three species are from the West.

Trilliums are a bit out of the scope of this Handbook, but the finest of the lot, the double-flowered white one, *Trillium grandiflorum* 'Flore Pleno', brings a touch of elegance to the spring woodland garden. Even people who think of double flowers as obese poodles are fond of it. There is no such thing as a bad trillium, and other native sorts should be tried, including nodding (*T. cernuum*), purple (*T. erectum*) and painted (*T. umbellatum*).

Experiment too with less common natives. Two light-woodlanders which bloom in late spring and have subtle charm are fairy-wand (*Chamaelirium luteum*) and fly-poison (*Amianthium muscitoxicum*). Both have small, creamy white flowers in terminal racemes, on stalks a foot or more tall. Flowers fade yellow or green. They deserve to be better known. ❧



Schizostylis coccinea 'Mrs. Hegarty'

This year, why not . . .

SOUTH AFRICAN BULBS

Elizabeth Scholtz

The smell of freesias will forever evoke for me the picture of a cool bright September day in the veld. September is spring in South Africa and brings the delights of wildflowers in super-abundance, especially in the western Cape Province. It is no wonder that European plant hunters of earlier centuries raved about this supremely floriferous area. William John

Burchell, an English botanist, wrote in 1911 after a summer (not spring) visit to the Cape: "At every step I recognized some well-known flower that I had seen nursed with great care in the greenhouses of England."

Many of the plants that Burchell saw were brightly colored annuals and flowering shrubs, but it is the wealth of bulbous

Resembling a spray of orchids, *Ixia* 'Conqueror' has creamy petals with a deep red eye set off by orange stamen and pistels.



plants (and I use the term bulb loosely to include those monocotyledonous plants with underground storage organs) that impressed him and other plant hunters. The "bulbs" belong to the Iris, Lily, Amaryllis and Oxalis families, and, like the freesias, many of them have wonderfully fragrant flowers which have become favorites in cultivation.

Other South African gifts to world horticulture include *Agapanthus* (which has been grown in Europe for three centuries), *Clivia*, bird-of-paradise (*Strelitzia*, which has become the floral emblem of Los Angeles), *Veltheimia*, red hot poker (*Kniphofia*), *Galtonia*, pineapple-lily (*Eucomis*) and calla-lily (*Zantedeschia*). In recent years nursery catalogs have included *Ixia*, *Sparaxis* and *Lachenalia*, all denizens of the Cape veld in spring, as well as an occasional species *gladiolus*.

As the South African climate in the main is quite mild, many of the South African plants would not survive outdoors in the rigors of a U.S. northern winter. So it is those plants which can be adapted to container growing that are desirable in the colder climes. (Bulb frames raise additional possibilities—see article on them in *BBG Handbook on Rock Gardening*, page 73.) Many are grown out-of-doors in the warmer areas and indoors or as annuals in the north. More than fifty genera are listed in Sarah Coombs' *South African Plants for American Gardens*, and there are many different species in such genera as *Moraea*, *Nerine*, *Oxalis*, *Watsonia* and *Zantedeschia*. Increased interest in gardening in the Sunbelt of this country should see more of these plants in cultivation.

In Other Lands

It was during a visit to New Zealand that I was surprised to see a mass of clear pale green flowers in a horticulturist's garden. There was no mistaking *Ixia viridiflora*, a plant which is quite rare even in the South

African veld. On enquiry I discovered that New Zealand gardeners had long cultivated South African bulbs, and my horticultural friend was delighted to show me *Streptanthera* brightening the corner of another garden in Christchurch. British gardeners have long used South African bulbs to good effect. *Kniphofia* (*Tritoma*) is a special favorite, with numerous brightly colored cultivars having been selected. I am glad to say that *Kniphofia* is also hardy as far as coastal New England and thrives in BBG's Monocot Border, as does *Galtonia candicans*, the summer-hyacinth.

I shall never forget the charming sight of fairy fishing rod (*Dierama pendula*) blooming on Christopher Lloyd's terrace at Great Dixter. The species *Gladiolus* are often found in flower borders in England. With their graceful habit, muted flower colors and haunting fragrance, they bear no resemblance to the bold spears that we associate with that name, and which are the result of a century and a half of hybridizing from the wild species. Some of the wildings have charmingly marked flowers which have earned them the name painted ladies.

Experiments

Thomas Hofmann, the propagator at BBG, has had a measure of success with no fewer than seventy-five different South African bulbs in the last decade. These include

Amaryllis belladonna, *Babiana*, *Crinum*, *Gloriosa rothschildiana*, *Haemanthus katherinae*, *Moraea* spp., *Nerine* spp., *Ornithogalum*, *Oxalis* spp., *Schizostylis coccinea*, *Watsonia* spp. and four species of *Zantedeschia*, (which bear white, yellow, pink and green flowers).

Perhaps Mr. Hofmann's greatest success has been with *Cyrtanthus*, the South African fire-lilies. The best known of these is *Cyrtanthus ochroleucus*, which has floppy straplike leaves, and pastel-shaded tubular flowers with a clear fresh fragrance. This and several other species have proved to be the most satisfactory and floriferous pot plants among the South African bulbs. Now included in the genus *Cyrtanthus* is the Scarborough-lily, known for years as *Vallota speci-*

osa, but currently *Cyrtanthus purpureus*.

The common name of Scarborough-lily refers to a place in England where the plant is grown to perfection. This brings to mind another South African bulb that in Europe has long been known as the Guernsey-lily (*Nerine sarniensis*). Legend has it that a Dutch East India Company ship with boxes of Cape bulbs was wrecked near the Channel Island of Guernsey in 1659. The bulbs floated ashore, took root and delighted all who saw the scarlet and rose gold-dusted flowers that resulted. These plants soon became popular in flower markets in England and on the Continent. It is surprising that nerine and other South African bulbs are not better known in this country. Why not grow some this year? You will be in for a pleasant surprise. ❀

How Hardy Are South African Bulbs?

They vary considerably in their ability to survive winter on the East Coast of North America, though most are quite well adapted to California. An occasional florist gladiolus will endure the rigors of a Massachusetts January, but don't count on it. (The graceful purple-flowered, small but vigorous *Gladiolus byzantinus* from the Mediterranean region is the safest for northern gardens.) *Crinum x powellii*, usually grown as a summer pot plant for its scented, large pink or white lilylike flowers, and then wintered indoors, is able to cope with a Long Island winter if planted on the south side of a house foundation and mulched with several inches of salt hay in late autumn. (Same with *Eucharis grandiflora* from South America.) *Crinum* bulbs are huge, and need deep, rich soil.

Vermilion-flowered *Crocosmia masonorum* and hellfire-red *C. 'Lucifer'* are more-or-less hardy to Connecticut if mulched well in the lean months. Red-hot poker (*Kniphofia*) and summer-hyacinth (*Galtonia candicans*) usually survive northern winters but don't care for Vermont.

From Tidewater Virginia, Pamela J. Harper, a frequent contributor to BBG Handbooks, reports that *Dierama pendulum* was killed to the ground by a 3°F temperature one recent winter but came back to bear its graceful pink flowers in late summer. *Nerine bowdenii*, which has electric rose pink flowers in autumn, is hardy there, too. Mrs. Harper also successfully grows *Rhodohypoxis baurei* (bright pink, late May, some recurrent bloom). There are selections with soft pink or white flowers. Plants are low-growing, offering something different for the southern rock garden. *Cyrtanthus mackenii* bears creamy salmon flowers for her in November, but frost is apt to nip them after a week.

Several kinds of *Agapanthus* are hardy in Virginia, blooming in June. A calla-lily, *Zantedeschia aethiopica* 'Crowborough', takes coastal Virginia winters well, bearing white flowers in summer. (Hardiness much further north is overrated.) It requires plenty of moisture. Kaffir-lily (*Schizostylis coccinea*) is hardy there and as far north as Washington, D.C., but is choosy about site. It needs a sunny, moist but not waterlogged part of the garden, away from tree roots. *Schizostylis* is an autumn bloomer with crimson flowers in the typical form, but a number of named varieties with different tints are known. Pale pink 'Mrs. Hegarty' is choice. ❀



'Tunis' daffodils forced indoors.

FORCING OF SPRING-FLOWERING BULBS

August De Hertogh

Causing bulbs to flower by other than naturally occurring climatic conditions is called *forcing*. For the homeowner, this can be a real and yet pleasant challenge. The procedures for having a pot of hyacinths in flower in January are quite simple. To do this requires some knowledge of the basic growth and development requirements of the bulbs and then applying a few easy steps (Table 1).

There are two general groups of bulbs for forcing. One consists of those bulbs such as tulips, hyacinths, daffodils and crocus, all of which need an extended period of low temperature in order to flower

normally. The information required to force this group into flowering in January to March will be covered in this article. The other group consists of mild-climate bulbs like amaryllis (*Hippeastrum*) paper-white narcissus and *Clivia*, which do not require low temperatures.

The principal factor controlling the growth and development of all spring-flowering bulbs is temperature. On an annual basis, these bulbs require a warm (summer)—cool (fall and winter)—warm (spring) sequence of temperatures. During forcing, factors including light, fertilizer and bulb size are also important and they

Table 1. HANDLING SEQUENCE FOR STANDARD FORCING.

Time	Handling procedures
April/May	Plan your forcing and order special bulbs (Table 2).
September	Inspect bulbs, store cool before planting, and plant.
Oct. to Jan.	Root and satisfy cold-requirements of bulbs.
Jan. to March	Force bulbs in 60°F area in the home.

shall be mentioned where appropriate.

Standard Forcing

Principles of forcing. The most common forcing procedure for spring-flowering bulbs is called "standard forcing." This technique is based upon the natural growth and development cycle of the bulbs. The basic steps are as follows: the bulbs are harvested in early June to late July, stored at a warm temperature (63-75°F) to develop the flower(s), planted and cooled at 35-40°F for 10 to 18 weeks, and then placed in the greenhouse or home for flowering. The handling sequence for standard forcing is outlined in Table 1.

Planning. It is essential that the proper

cultivars (varieties) be selected. For instance, not all tulips are suitable for forcing. Table 2 provides a list of bulbs which can be forced in the period of January to March. Other novelty bulbs which can be forced include: *Anemone blanda* 'White Splendour' and 'Radar', *Chionodoxa*, *Er-anthis*, *Galanthus*, *Ornithogalum umbellatum*, *Puschkinia libanotica*, *Scilla siberica* 'Spring Beauty' and *Scilla tubergeniana*. In general, it is best to force these only in late January and February. As pointed out above, the harvest season starts in June. Thus, whenever possible, order your bulbs early. "Think Spring in Spring." This would be particularly true if you want to force "prepared" hyacinths.

Table 2. BULBS, SPECIES AND CULTIVARS FOR JANUARY TO MARCH FORCING.

Species	Color/Type	Cultivars
Tulips	Red	Bing Crosby, Cassini, Charles, Olaf, Paul Richter, Prominence
	Pink (Rose)	Blenda, Christmas Marvel, Preludium
	Yellow	Bellona, Monte Carlo
	White	Hibernia, Pax
	Lavender	Attila, Prince Charles
	Orange	Orange Monarch
	Apricot	Apricot Beauty
	Bicolors	Kees Nelis, Merry Widow
Hyacinths	Pink	Amsterdam, Anna Marie, Pink Pearl
	Blue	Delft Blue, Ostara
	White	Carnegie, White Pearl
Daffodils (<i>Narcissus</i>)	Trumpets (Yellow)	Dutch Master, Golden Harvest, Joseph MacLeod, Unsurpassable
	Large-cropped	Carlton (Yellow), Ice Follies (White)
	Small-cropped	Barrett Browning
	Double	Bridal Crown
	Cyclamineus (Yellow)	February Gold, Peeping Tom, Tete-à-Tete
Crocus	Lavender	Flower Record, Remembrance
	Striped	Pickwick
	White	Joan of Arc, Peter Pan
<i>Iris reticulata</i>	Blue	Harmony
	Lavender	Hercules
<i>Muscari armeniacum</i> (grape-hyacinth)	Blue	Early Giant (February/March only)



Forced hyacinths and tulips brighten winter days. The techniques are simple, the results are both attractive and, with many bulbs, fragrant.

This is a treatment which allows early forcing with a cold-week requirement of only 10 to 11 weeks as opposed to 13 to 15 weeks. Purchase only large-sized bulbs for forcing. This would be 12-13 cm (circumference) tulip, 17-18 cm hyacinth, 10-11 crocus, etc. Large bulbs help to ensure large flowers and are easier to force.

Storage before planting. When your bulbs arrive or after you purchase them, place them in open boxes, not in bags, and store them cool (less than 65°F). If possible, store the bulbs at 45-50°F prior to planting (precooling). If this is done, this period of time is counted as part of the cold-week treatment.

Special precooling of tulips. There are a limited number of tulips which can receive their entire low temperature treatment as unplanted bulbs. This technique is called "special precooling." Place the bulbs in open containers in a home refrigerator at 40-42°F for 12 to 15 weeks. Then plant the bulbs in a well-drained medium and place them at 55-60°F for two weeks prior to allowing the temperatures to go above 60°F and placing them in direct sunlight. The cultivars which are *not* suitable

for this forcing technique are: 'Bing Crosby' (red), 'Kees Nelis' (red with yellow edge), 'Olaf' and 'Prominence' (reds).

Planting. Under normal conditions the flower buds of all the bulbs listed in Table 1 are so well developed by September 1 that the bulbs can be planted immediately. The items needed are planting containers which can be as small as 4 inches to as large as 10 inches in diameter, and a well-drained planting medium. The latter is very important. In general, a mixture of one part loamy soil, one part peat and one part sand makes a good medium. Do not add fertilizer to the medium. When planting tulip bulbs, place the flat side of the bulb toward the outside of the pot. When this is done, the lowest leaf of the tulip will face the outside of the pot. Large bulbs should be planted so the noses (tips) of the bulb are even with the top of the pot. Small bulbs should be planted so they are covered with about 1 inch of the medium. They should be spaced about ¼ inch apart. Large bulbs can touch if desired. It is also possible to force hyacinths and crocus in water, and there are special glasses available for this procedure. Consult the bulb

catalogs or garden centers for these special glasses.

Rooting and cooling treatment. This is the real key to successful forcing. After planting, the pots must be placed where the bulbs can be easily watered to develop a good root system. At the same time they must receive continuous temperatures in the range of 35 to 48°F for at least 10 weeks for "prepared" hyacinth and 13 to 18 weeks for the other bulbs. If the bulbs are precooled, this period of low temperature is counted in the total cold-week treatment.

There are three facilities which can be employed to root and cool the bulbs. The best is to use an old household refrigerator. With such a facility, homeowners virtually anywhere can properly program the bulbs. Such a unit makes watering and inspection easy. If one uses a refrigerator, initially hold the temperature at 48°F until the roots begin to come out of the holes of the containers. Normally, this takes 5 to 7 weeks after planting. Subsequently, lower the temperature to 35-41°F until the bulbs are taken out.

The other two facilities which can be used are cold cellars and outdoor cold-frames or rooting beds. Since the key aspect for the use of these facilities is the prevailing weather, they are normally suitable only for climatic zones 4 and 5 and

in the higher mountain elevations with similar temperatures. The key to using these facilities is to ensure that the temperatures stay between 33 to 50°F. The pots should not be allowed to freeze. Thus, with outdoor frames or beds, it is essential that the pots be covered with about 3 inches of sand, and the others 3 to 6 inches of sawdust, pine bark or some other mulching material.

Home forcing. After the bulbs have had at least 13 continuous cold-weeks (10 weeks for prepared hyacinths), the first pots can be brought into the house for forcing. If, by chance, they have been frozen, be certain not to touch the shoots and to thaw bulbs slowly. Otherwise, place the pots in a well-lighted area (they can be in direct sunlight) at about 60°F. After a week or so, tulips can be given some fertilizer, particularly one containing calcium. Water lightly as needed. When the flowers begin to show color, take them out of direct sunlight. Depending on the bulb species and cultivar, they normally take 2 to 4 weeks to come into flower and last 10 to 14 days in flower. Bulbs which have been forced should not be forced again. Thus, if one wants to save them, place them in the garden as soon as possible in the spring. Just knock them out of the pots and bury the bulbs 5 to 6 inches deep and handle like normal garden bulbs. ❀

Forcing Paper-Whites

One of the remedial pleasures for a long winter is to buy a few bulbs of paper-white narcissus from a garden center and take them home for forcing. These are mild-climate daffodils and cannot stand freezing, but must have a cool period to develop the roots before they flower. The process is simple, and sand, pebbles, perlite or soil may be used as the growing medium. The bulbs should be set upright on a 2 or 3 inch layer of whatever material is being used, and more of the same material poured around them. Don't pack it down, though, since the roots that grow out of the bottoms of the bulbs need something easy to penetrate and hang on to. Add enough water to barely touch the bottoms of the bulbs and place the planted container in a dark place. The cooler this is, the better, as long as it is above freezing. Replenish the water as needed, and bring out into the light as soon as the sprouts are 3 inches high. In a remarkably short time white, sweetly-scented blossoms will appear. The cooler they are kept, the longer they will last, and, if they tend to topple over, stakes made from chopsticks purloined from a Chinese restaurant will prop them up neatly. Once forced, the bulbs are, to all intents and purposes, worthless, so compost them and buy a fresh batch—they're very inexpensive. ❀



Spectacular foliage of caladiums

Expanding the horizons of indoor gardening . . .

TROPICAL BULBS AS HOUSE PLANTS

Richard W. Langer

Most people have forced bulbs at one time or another, even if it was only, as a child, to plant a sprouted onion from the kitchen. What many people aren't aware of, however, is that there is a whole host of bulb plants that can be grown year after year indoors as pot plants. You don't need a large bedding garden outdoors to enjoy the splendor of these beauties. The very fact that they are tropical in origin, as a matter

of fact, rules out their residence in your garden unless you live in the Deep South.

Amaryllis

The amaryllis is a splendid example of this group of house plants, and probably the most well-known. Its mammoth flowers either complement your decor as a striking accent or stand out like a sore thumb, de-

pending on your taste. For similar reasons, the following list of bulbs to grow as pot plants is alphabetical. Choose the ones that strike your eye.

First, of course, comes that amaryllis I mentioned. After all, it does begin with A, though that's not really the case, since its true name is *Hippeastrum*. *H. vittatum*, to be specific. However, it's almost always sold as an amaryllis, so I will leave it at the head of the list.

Peru is the plant's native habitat. Nevertheless, as is so often the case with bulb plants, the modern superhybrids are often of Dutch origin. *Hippeastrums* are easy to grow, producing huge lily-shaped flowers four to five inches or more across.

Speaking of size, when it comes to tropical bulbs, bigger definitely means better. Not only will really small bulbs not flower, but the bigger the bulb, the bigger and more profuse the flowers. So choose large plump bulbs when purchasing locally. When buying by mail, deal with established sellers and make sure to get your order in well before freezing weather.

Pot bulbs as soon as possible, making sure to remove any dead, dried or broken roots. Handle gently so you don't damage the live roots. These are needed to give the plants a good start.

Leave about two inches on a side between bulb and pot. My own preference is for the traditional clay pot, although I'm told bulbs also do quite well in plastic pots. Use a potting mixture of more or less equal parts good loam, humus and sharp sand, adding half a tablespoon of bone meal per pot. Or use a good prepackaged potting soil, again adding the extra bone meal as a flower booster. Set the bulb so it is only half covered with soil. Then soak the pot in lukewarm water to settle the soil, drain it and set it in a dim, warm (70°F) place. Keep the soil slightly moist. Once the spear-shaped flower scape begins to protrude, move the plant into bright light. Water it more then, but do not let the soil stay wet. Turn the pot to keep the flower scape erect. Fertilize biweekly and enjoy.

After the amaryllis flowers have begun to wilt, pinch them off at the top. A few days later, cut off the scape near the bottom. Don't worry about the sap that will ooze out. It will help seal off the wound.

Let the leaves grow through the spring and summer and, as with other bulbs, don't cut the plant itself back until it has wilted completely. While the leaves are fading, the temptation is always to snip off the unsightly mess, but as long as there is any life left in them at all, those leaves are energizing the bulb for the following year's growth.

Once the leaves have been cut off, let the plant rest in a cool (50 to 60°F) place until a new flower scape begins to rise from the bulb. Then scratch away the top inch or so of soil, replace it with fresh soil, fertilize, and get ready for another spectacular flowering cycle.

Achimenes, Caladium

Rhizomes aren't true bulbs. Morphologically, they are underground storage stems, the most common example, perhaps, being the potato. Still, they are grown more or less the way bulbs are, and the rhizomatous *Achimenes flava* has the added plus of producing yellow flowers, one of the rarer colors on the indoor bulb palette, which usually features reds, oranges, blues and whites.

Primarily for warm greenhouses or terrariums, the achimenes really need a high-humidity atmosphere. They also seem to be particularly sensitive to pollution. The flat-faced petunialike blossoms usually grow in pairs among the graceful trailing stems.

Plant rhizomes during March, barely covering them with soil, and keep them constantly moist but not wet. As soon as growth starts, feed once a week with fertilizer. Less more often is the best fertilizer policy for these gesneriads. Don't ever let the soil dry out, or your plants will go back into hibernation. But in autumn, after flowering, stop all watering until the soil is powdery dry. Then dig up the rhizomes, gently breaking off any remaining withered foilage. You should find three to five new rhizomes for each one you planted. Store these at 60°F in a plastic bag filled with vermiculite and just a drop or two of water. Plant again the following March.

Caladiums are grown not for their flowers, but rather for their multicolored and extravagantly-sized leaves. These plants, available in many varieties, are all hybrids,



The largest bloomed indoor bulbs, amaryllis with proper rest and care can be forced repeatedly. Big healthy bulbs yield multi-flowered stalks.

predominantly with either white or red marble patterns on almost translucent large leaves rising on thin stems. The ones you buy already in leafy splendor have been grown under 80°F, 80% humidity greenhouse conditions. You will rarely match their splendor at home.

The plants look frail. In some ways they are, in others not. Direct sun will scorch the leaves. Air conditioning or drafts will send them into a palpitating frenzy that folds up their leaves and kills them. Otherwise they are pretty durable. From February to April plant one or more tubers in five-inch pots, covering them with about an inch of standard potting mix with a handful of extra peat moss. Keep them at 75°F with the soil barely moist until growth starts. Once leafing begins, however, the plants are heavy drinkers.

Let the foliage die down and dry out the tubers in winter for a rest period. Come spring, you're all set for a new show. Division of new bulbs gives you extra plants.

Cyclamen

The florists' cyclamen (*C. persicum*) is a strange "backward" flower. The blossom has petallike corolla lobes that bend back

and up from the center, giving it an inside-out appearance. It blooms in a broad spectrum of color from white through glowing red, including many shades of pastel pink. Flowering is profuse in fall and winter. The plant grows from a tuber that needs a July-August rest period in order to bloom the following year. When repotting, plant the tuber to the same depth as before, that is, with the tuber about halfway out of the soil. Water the soil, never the protruding tuber or you may induce rot. Cyclamen may also be grown from seed, usually sown in August. It will take at least eighteen months to flower.

As with anything having to do with horticulture, generalized rules are simply that. One year, for instance, I absentmindedly never gave my cyclamens a rest at all. Yet not only did they bloom lavishly, albeit a bit later than normal, but the silver-veined foliage was perfect, something that doesn't always happen the second time around.

Some Plants Called Lilies

Like most tropical bulbs, the Amazon-lily (*Eucharis grandiflora*) is grown in a pot small enough so that the plant will be pot-bound by the time it is in flower. Unlike

The brightly speckled foliage of callalilies contrasts well with the elegant, austere flowers. It will take all the water it is given because it is a wet-soil lover.



George Tidmanis

the previously mentioned bulbs, however, *E. grandiflora* is a little tricky to grow because high humidity is a must.

The flowers look somewhat like large white daffodils, are very fragrant and make their appearance several times a year, all of which should be enough encouragement to give them a try if you can find the bulbs. Plant one or two in a five-inch-diameter pot, and cover with about an inch of soil. Keep the soil moist, but don't water heavily until the first shoot shows itself. A warm location, 70 to 80°F, with bottom heat if possible, helps it get going. After flowering, be more sparing with the water. A month of relatively dry soil will usually initiate blooming again.

Eucomis, the pineapple-lily, is grown in the same way as the amaryllis—with one big exception. The bulb should be completely covered with soil to a depth of about two inches. It produces two-inch white, yellow or greenish flowers in a thick, upright spike, sometimes spotted with purple, depending on the species.

Haemanthus katharinae, the blood-lily, is the best haemanthus because, unlike most bulbs, it keeps its green foliage almost throughout the year. The fleshy leaves are sword-shaped, wide and thin, with a depressed midrib. The six-inch-round flower head is composed of up to fifty small starlike salmon flowers with protruding red stamens, and is borne on a separate stalk. Flowering is usually from spring until August.

Like your other house plants, *Haemanthus* needs fertilizing, particularly in the period before and during flowering. After flowering, until dormancy sets in, a supplement of fertilizer low in nitrogen and high in potash and phosphorus will help the bulb along for the next season. Keep it cool, 50 to 60°F. At the same time, gradually reduce watering until you've cut back to the point where the soil is kept just a

step from being dry for the duration of the rest period, which runs through midwinter.

Haemanthus albiflos, the white blood-lily, *H. coccineus*, the scarlet blood-lily, and *H. multiflorus*, the salmon blood-lily, produce similarly impressive flower balls in various colors. Their foliage, however, dies back completely, the plants taking a more noticeable rest period of six to twelve weeks.

Grow haemanthus plants in five-inch pots and do not repot unless the bulbs decline in size, which will take a number of years. When you do repot, new bulb offsets can be removed and planted separately. The bulbs are always potted so that the top third remains above soil level. Once a year, scrape away the topsoil, making sure not to disturb the fussy roots, and replace it, including some dried cow manure. This is a substitute for repotting, which the plants really don't like.

Other Bulbs

Like so many plants from Africa, *Lachenalia* has succulent foliage. The leaves store water for use during a dry spell. However, the plants will do best if the soil

is kept constantly though barely moist.

Half a dozen bulbs to a pot make for a lush display of spires of golden to coral red flowers, depending on the species. You may not have much of a choice, since the bulbs are relatively hard to find. The plants can be grown from seed, but be prepared to wait three or even four years for flowers if you do so.

For best results, the night temperatures should be cool, in the high 40s, during the winter to early spring flowering season. The succulent leaves notwithstanding, high humidity is a must. And since the drooping foliage bruises easily, this is one bulb plant best grown in a hanging pot, where the leaves can be allowed to dangle down as far as they want.

A feature of the *Nerine* from South Africa are the striking pink to scarlet to crimson flowers with recurving petals and extended showy stamens. The most popular variety, *N. sarniensis*, often sold as the Guernsey-lily, easily remains in bloom from late summer into winter.

Another cool grower that does best with temperatures no higher than 65°F just before and during flowering, *Nerine* likes lots of light and high humidity. Plant it as you would an amaryllis, but be very sparing with water until the new growth appears. Then water and fertilize regularly.

An old favorite cold remedy, cauterizer and curiosity, *Ornithogalum caudatum*, is making a comeback. It is sometimes called the "pregnant onion." The big green bulb, usually over four inches in diameter, grows *on top* of the soil, producing half a dozen channeled straplike leaves and a single long-lasting stalked raceme up to three feet long and bearing more than fifty one-inch flowers. It is easy to grow if you let the plant dry and rest after flowering. Baby "onions" clamber up the sides of the main bulb at the end of the growing season and can easily be used for propagation. In Germany, a folk remedy involves the use of the *Meerzwiebel*, or sea-onion, leaves crushed to cauterize wounds. A sugar syrup, known as syrup of squill, is also made using the leaves for flavoring. Hardened into rock candy, it is then used as cough drops.

Since this is the false sea-onion, if you're looking for the real one, it's *Urginea ma-*

ritima, also known as the shore drug-squill. A slightly larger plant whose flower raceme forms after the leaves have died down, it takes the same care as *O. caudatum*—lots of sun and temperatures in the high 60s and low 70s—except that *U. maritima* should be kept dry between the leaf and flowering stages. Besides being good for coughs, this one is also an emetic and a cathartic. *Bowiea volubilis*, climbing onion, sometimes mistakenly called sea-onion, is another bulb oddity with an exposed base.

The poor man's amaryllis, *Cyrtanthus purpureus* (*Vallota speciosa*), or the Scarborough-lily, besides being less costly than hippeastrums, is also evergreen, which means you don't have to find a place to hide the plant during its bald stage as you do the hippeastrums. The strap-shaped leaves grow up to two feet long and the flower stalk to three. The latter is surmounted by a cluster of long-lasting scarlet flowers, three inches across, that usually bloom from June till fall. Given good sun, strong mature bulbs will produce a series of flower stalks in succession. Cut away the stalks after flowering. Keep the plant moderately moist even during its cool winter rest period—remember, it's an evergreen. If all the foliage does die down, give the plant a month's rest, then water and apply bottom heat.

Like the skunk-cabbage, *Zantedeschia aethiopica*, the calla-lily, is a swamp plant. It is, in fact, one of the few house plants that cannot be overwatered. So plant the tuber and grow the plant in the same way as a caladium, but give it even more water. Flowers bloom in winter and spring when the plant is two to four feet tall. Besides the copious supply of water, it needs good sunlight, warmth and fertilizer to produce the familiar waxy white spathes. These are actually leaves, not flowers. In the center of the protective spathe is a long bright yellow spadix on which are mounted numerous tiny true flowers, the males on the top part, the females toward the base.

Summer-blooming *Z. elliottiana*, or the golden calla-lily, has deep yellow spathes. Those of *Z. rehmanii*, the rose calla-lily, are pink. The summer bloomers are usually potted in late winter or spring. Both like a little less sun than *Z. aethiopica*. ❧

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Eva Melady

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he plants it for posterity.**

—Alexander Smith

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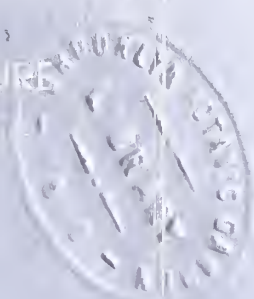
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BROOKLYN BOTANIC GARDEN RECORD

PLANTS & GARDENS

Vol. 37

Winter 1981-82 (March, 1982)

No. 4

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Brooklyn Botanic Garden Record, Plants and Gardens (ISSN 0362-5850) is published quarterly at 1000 Washington Ave., Brooklyn, N.Y. 11225, by the Brooklyn Botanic Garden, Inc. Second-class-postage paid at Brooklyn, N.Y., and at additional mailing offices. Subscription included in Botanic Garden membership dues (\$15.00 per year). To others, \$5.00 per year (\$8.50 for two years). Copyright © 1982 by the Brooklyn Botanic Garden, Inc.

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Nephthytis (*Syngonium podophyllum*), an aroid from Central America, has several variegated forms. Like *Philodendron*, which belongs to the same plant family, it grows well in low light, eventually forming a vine.

LETTER FROM THE BROOKLYN BOTANIC GARDEN

A new gardening year is beginning, but before it is in full swing it is good to pause and reflect on the last one. That goes for gardening articles, too. As older BBG members know, one of the features of the Winter PLANTS & GARDENS has to do with reprints of timely and/or outstanding articles which have appeared in other publications in the previous twelve months. It is a way the Botanic Garden can recognize those authors and fellow periodicals who are getting the message of horticulture across loud and clear, and it also enables BBG to inform members of some of the more interesting current developments in the field. The Winter P&G also presents brief reports on the preceding year's gardening books. A warm word of thanks from the Editorial Committee goes to the authors and publications kind enough to share their expertise with BBG members.

New gardening years are times for stock-taking, too. Some things went very well in the garden in 1981, and some things didn't, particularly if you lived in an area where gypsy moths or Japanese beetles were on the rampage. Despite the best-made plans there are surprises, most of them pleasant, and we win enough to want to continue our efforts (and then some) the next year. However, if we were to have it all our way, we would lose interest. In our own garden the zucchini plants died and, while my wife and I took it personally, we were the envy of three counties.

Good gardening depends on good observation. It helps to keep a garden diary, with entries written weekly. These need not and will not be extensive, for most keen gardeners have some difficulty lifting a pencil after a day on the back forty, especially in spring as muscles learn to unsqueak again. However, some record is in order—bloom times of perennials, date the first peas ripen (as opposed to what the catalog tells you), and first autumn frost. More important, perhaps, are performance reports. If mignonette doesn't do well, why grow it? Our thoughts in July are less sentimental than in March, and it helps to have a note on them before we don rose-colored glasses. If a plant needs undue spraying or dusting, why bother with it at all? There are plenty of other good ones.

At this time of year there is another aid to gardening. Pick up a pencil while strength is in hand, and resolve to cut maintenance three ways. Often it is simply a matter of doing away with the turf around shrubs and making "islands" of shrubs so the lawn mower doesn't have to weave in and out. (For another aspect of turf, see page 34.) In addition, there are few gardens which would not benefit from mulching. A two- or three-inch layer of shredded leaves, pine needles, cocoa-bean hulls or other porous material can do wonders in keeping weeds down and moisture in the soil. Frequently the design of a garden gets in the way of effective maintenance, too. The length of the border should never exceed the length of the hose.

Another resolution for the new season? Plan to visit the Botanic Garden, not only in spring when most shrubs and trees are at their flowering peak, but in summer, autumn and winter. For the observant gardener there are advantages to visiting in other than peak times. Often one sees more, for the flowers don't overwhelm, and it is possible to get a better sense of space. For a change of pace look not so much at the plants as at the way they are arranged within a framework that provides both beauty and relatively low maintenance. There is much for the home gardener to learn from frequent visits.

And, above all, good gardening this year!

Sincerely,

Frederick McCourt
Editor



GIVERNY

The Garden of Claude Monet

Mary Tonetti Dorra

Reprinted from THE GARDEN CLUB OF AMERICA BULLETIN, Winter, 1981

Claude Monet, the artist after one of whose paintings the Impressionist movement was named, spent the last 43 years of his life at Giverny, which is about fifty miles northwest of Paris. When he was not painting, Monet was often creating designs for, working in, thinking about, or showing proudly his four-acre garden which was one of the great joys of his life.

"My garden is a slow work, pursued with love, and I do not deny I am

proud of it. Forty years ago, when I established myself here there was nothing but a farmhouse and a poor orchard . . . I bought the house and little by little I enlarged and organized it . . . I dug, planted, weeded myself; in the evenings the children watered."

(Claire Joyes's *Monet at Giverny*, Matthews Miller Dunbar, London 1975)

His stepdaughter, the last of Monet's descendants who had the interest and

Spanning part of the famous waterlily pond, the restored Japanese bridge is covered with wisteria.

Vahé. As in the case of Versailles, Van der Kemp counted on the generosity of American benefactors. Lila Acheson Wallace, who with her husband DeWitt had founded the *Reader's Digest*, gave the first of the two and one half million dollars it cost to recreate the garden.

The problems were staggering but in June, 1980, Giverny was opened to the public after three years of hard work by Vahé and his five assistants. In the first place the present team of gardeners is no larger than Monet's, and that team worked twelve hours a day six days a week! In Monet's time every wilting bloom was cut off, and one man was assigned on a full time basis to the water lilies. An elaborate watering system had to be installed, and much money and effort was devoted to enriching the rather poor soil. One particularly vexing problem had sprung up since Monet's era: muskrats, which had been let loose in the area since coats made of their

means to support the garden, died in 1940. For the next thirty-five years or so the garden became more and more a rampant jungle until the French Academy of the Fine Arts, to which it was finally bequeathed, asked Gerald Van der Kemp, the retired director of Versailles who did so much to restore that palace and its grounds, to do a similar job at Giverny. Van der Kemp raised the funds, spent the endless hours doing the necessary research and hired a most capable head gardener: Gilbert



Hollyhocks and nasturtiums surround the young roses that will eventually cover the trellises.

pelts were no longer fashionable, took to devouring the water lily bulbs (Bennett Schiff, "An Artist's Garden Blooms Again in Monet's Giverny," *Smithsonian*, February 1980).

Finally, the very success of the present undertaking is creating difficulties Monet and his gardeners never had to face. No less than two thousand visitors were counted one Sunday last June, and although vandalism does not present a significant problem, especially wide paths had to be designed to accommodate the crowds. And whereas Monet and his friends would casually stroll across the dirt road and railway tracks separating the pond from the rest of the garden on his ritual after-lunch tour, today an underground passage is needed; it was built thanks to the generosity of the Honorable Walter Annenberg.

When asked if the gardens are indeed the same as in Monet's time, M. Vahé answered, "The garden kept changing even in the painter's lifetime, but the spirit, we hope, is the same." Indeed, old photographs recall a number of very different arrangements, and a choice had to be made for the placement of practically every flower bed and path. Two factors were constant, however: at any one point the visitor was to be surrounded by colored masses, and feel almost submerged in them. Furthermore, the plants had to be so chosen that from April until November the multicolored arrangement should be both harmonious and exciting. After going through old photographs of the garden and Monet's correspondence, countless bills from seed stores and flower catalogues of the period, Gerald Van der Kemp and Gilbert Vahé succeeded in creating symphonic effects worthy of Monet's paintings. If plants could not be found in France they were ordered from Germany, England, the Netherlands, America and even Japan. Much in the same spirit as Monet received rare lily bulbs from his friends, the Kurokis, in Japan, so Van der Kemp received native iris from Louisiana which are doing beautifully along the banks of the lily pond.

Monet referred to his garden project as "slow work." The restoration will also take years. When one sees the enormous

trellises near the house with hollyhocks and climbing roses no higher than the half-way mark, one must rejoice in anticipation of the colored masses that will eventually be floating between sky and earth, just as one presently takes delight in the alternating hues of the existing blossoms.

Beautiful Any Season

It is difficult, if not impossible, to say when the garden is most worthy of a visit. Even those who work at Giverny are not all in agreement as to when it is the most beautiful. In spring the water garden is glorious, when the Japanese bridge is covered with white wisteria and masses of rhododendrons reflect in the lily pond. A profusion of spring bulbs, masses of iris, tulips and daffodils contribute lively hues to all the flower beds.

Gradually waves of spring flowers give way to the summer ones. The mauve poppies seem to have been lifted right out of Monet's paintings. There are towering hollyhocks, foxgloves, Michaelmas daisies, phlox and cornflowers mixed with masses of white dahlias. Clumps of yellow roses are unexpectedly but happily mixed with red impatiens. The heat of summer brings out a veritable symphony of greens, and this is when the lily pond takes on a magical quality.

But it is the autumn which holds perhaps the most surprises. One is astounded by the number of flowers which are blooming here at this time of year. There are delphiniums juxtaposed with the masses of dahlias of all varieties. Flower beds suddenly burst with snapdragons, cosmos, pinks, lavender in bloom, sage, pelargoniums, Michaelmas daisies and the colorful rose hips as big as plums!

You are reminded, no matter what season you choose to visit, that this is a painter's garden. At all times one notices a studied carelessness in the distribution of the lilies in the pond and the nasturtiums along the walk. These along with the asymmetry of the paths and lawn areas and the subtle disharmony of certain blossoming bushes bring to mind one of the ideals of the Impressionist school: creating a sense of life through echoing the imperfections of nature. ❧



Tori gate in winter at BBG

A dialectic with nature. . . .

THE JAPANESE GARDEN

Elizabeth Scholtz

Reprinted from *DIVERSION*, March, 1981

After Paul Takuma Tono, the famous Japanese landscape architect, had spent several days showing a group of Americans some of the most remarkable gardens in and around Kyoto, one member of the group stopped him in his tracks by asking, "But when are we going to see the gardens?"

It was an honest question, typical of visitors from Western countries, who think of gardens as places of plants flowering in harmonies of colors, laid out in varying degrees of symmetry and formality. Most of the gardens that Professor Tono had been showing off were monochromatic or subdued in color, and to his American vis-

itors, the gardens seemed more or less natural landscapes.

That is the secret of Japanese gardens. They "hold a mirror to nature, capturing natural scenes in miniaturized form," Tono explains. As another Japanese landscape architect expressed it, "The beauty of nature inspired us, we in turn inspired nature, and that produced beauty new to nature." Japanese gardens are deceptively simple reproductions of beautiful scenery, skillfully condensed by artists working in three dimensions.

The Priorities of the Art

Far more important than the pleasure an



The importance of careful selection of weeping, contorted and dwarf trees and shrubs is revealed especially in winter, as is meticulous pruning.

observer takes in viewing a Japanese garden is the state of mind it induces in him. The ideal Japanese garden is intended to be a retreat for leisure hours; it has a philosophical dimension that is paramount, and its rich, deeper meaning is there for anyone who seeks more than the sprightliness of color, the comeliness of symmetry, or the display of unusual plants.

Japanese gardens derive in part from those of medieval China, but they are further refined and stylized; they have gained a spirituality, as well as a sophisticated and subtle representation of nature never present in their Chinese models. Tono has written that Japanese gardens are "intended to break the connection with the outside world, so to speak, and produce a fresh sensation conducive to full enjoyment of aestheticism in nature."

The art of gardening in Japan has been practiced for over fourteen-hundred years, but Japanese-inspired gardens were first

created in the Western world only a hundred years ago. The most successful of these demonstrate an awareness of the symbolism and spiritual content of the Japanese originals, qualities not achieved simply by placing a curved red bridge across a stream or by dotting the landscape with stone lanterns.

Elemental Symbols

The symbolism of the Japanese garden is derived from the ancient Shinto faith, which long preceded Buddhism in Japan. In this basically simple nature worship, anything that is the object of reverence and respect—animate or inanimate, heavenly or earthly—is considered a deity. The pine tree and other evergreens, for example, symbolize longevity; bamboo represents strength; and the Japanese apricot tree stands for bravery, because its earliest flowers open in the cold days of early spring. A waterfall symbolizes life itself,

ever renewing, and rocks, the most fundamental of nature's objects, are the bones of the earth. Whenever possible, one or more of these elements is used in a Japanese garden.

But in what way do these disparate elements make up a garden? In the aesthetic of the Japanese garden, it is an essential tenet that a perfect setting imparts upon the viewer a special message. A proper garden contains water, rocks and plants, a combination representative of life itself but put together with an artfulness that fulfills the various elements, symbolizes their relationship to one another and the whole with an aesthetic intensity. Above and beyond the visual experience, the object of a Japanese garden is to stimulate contemplation and meditation, to join the essence of nature to man's mundane life.

The Essence of Water, The Soul of Stone

Water is an all-important element in the Japanese garden, for it is thought to purify and keep evil spirits at bay. Flowing water enlivens and refreshes, and the sound of even a small waterfall is much esteemed.

Where no water exists, its presence is often suggested in a garden by a stream of ripple-raked sand or pebbles.

Rocks and evergreens give the garden structural substance, for Japanese gardens are created to be enjoyed at all seasons. They do not depend on the evanescent beauty of spring flowers or the brilliance of autumn foliage, although in season both add a dimension that is prized.

True to Shinto tenets, rocks are thought by the Japanese gardener to be filled with life. The philosophy of Zen Buddhism, which reached its peak in the fifteenth century, was responsible for the making of temple gardens, which included rocks because of their static appearance and because they invited meditation. The particular rock used in each part of a garden has special import—craggy rocks suggest high mountains, smooth rocks look water-worn, as those found on the banks of rivers or lakes. And great care is taken to place the rocks in accordance with their grain.

Beyond the Walls

There are several types of Japanese gar-

Estelle Girard



The fastidious choice and placement of handsome stones, as well as the raking of gravel in wavelike patterns, are characteristic of the stone gardens of Japan. Kyoto's famed Ryoanji garden served as a model for BBG's, shown here.



dens: hill and pond gardens, inspired by the boating and strolling gardens of medieval China; flat gardens of rock and sand (such as the Ryoanji Temple Stone Garden in Kyoto) and free-form asymmetrical beds of moss in fields of sand, both Zen-inspired; and the *roji*, or "dewy path garden," which is simply a narrow passageway between evergreen trees and shrubs with stepping-stones along its course. The *roji* often leads to a teahouse, or simply connects two larger gardens. *Roji* plantings consist of dwarfed trees and shade-tolerant shrubs and ferns.

A charming aspect of many Japanese gardens is "borrowed scenery," an aesthetic concept wherein distant landscapes and vistas become part of a garden's design. A graceful line of trees just beyond

the walls of a garden, providing a beautiful background for the garden, is scenery "borrowed" by the gardener to enhance his work. This has developed into a fine art in Japan; one of the most beautiful examples is the large imperial garden of Shugakuin Detached Palace, which borrows the hills of Kyoto that flank it.

The Aesthetic of Accessories

Stone lanterns, once placed along garden paths for the very practical purpose of lighting the way for evening strollers, have now become quite standard ornamental artifacts, except in those temple gardens where they act as memorials. In large temple gardens, lanterns can be monumental; more often, they are small and informal. Miniature stone pagodas are also common

A traditional water basin with bamboo dipper and a stone lantern line the path through the Roji Garden at the Brooklyn Botanic Garden.

decorations and are especially attractive when placed beside a series of sheared evergreen shrubs, simulating rolling hills.

It is most important that the lantern or pagoda be in scale with the surrounding plantings and not allowed to dominate the landscape. This applies also to water basins, roughly hewn out of rock or fashioned in the round shape of historical Japanese coins. A bamboo dipper is invariably placed on the rim of the water basin, and a bamboo pipe traditionally supplies the water. The most famous of the latter is the water basin of Ryoanji Temple garden, which bears the kanji inscription "I only know contentment."

With the ubiquitous presence of water, real or simulated, bridges are a necessity. They may be a single slab of rock or constructed of wood. A charming "drum" bridge, constructed of small logs tied together horizontally into a high arch, makes a charming reflection in the water below.

Another means of fording streams or even traversing wet places is stepping-stones, always artistically placed. In Japanese books dealing with garden art, traditional placements of these stones have poetic descriptions, such as "wild-goose flight," "plover flight," or "tottering step."

How to Create a Japanese Garden

For centuries, the bible of Japanese gardening was an eleventh-century "manual" called *Sakuteiki*, "Book of the Garden." It lays down the rules of making a garden in no uncertain terms, describing in detail how to create lakes, streams, and waterfalls, and spelling out the placement of trees and rocks. And it issues a stern warning: if the rules are not adhered to, "the owner will sicken unto death, his residence will be laid waste and become a dwelling place of demons."

A more realistic warning for the contemporary Western gardener planning a first

Japanese garden is that it will require enormous amounts of care. New owners learn that these deceptively natural- and untrammeled-looking landscapes demand constant pruning, grooming, and repair.

It makes sense, then, to start small—a garden planned within the dimensions of a room, perhaps sixteen to eighteen feet wide and twenty feet long. It should be adjacent to the house, and, ideally, enclosed on its three other sides, visible only through the window of the main room, never from the street.

To begin simply, consider a sand garden, with no grass to mow or clip. (Borrowed-scenery gardens are less adaptable, although in special situations, where the topography cooperates with distant hills or dramatic vistas, they can be delightful.) In the far corner of a sand garden a slender clump of hardy bamboo should be planted. The remaining space should be used artfully to incorporate a venerable-looking rock, much of its mass sunken beneath the earth. Two much smaller satellite rocks, unequal in size, might be close by, surrounded by a ring of ground-hugging vegetation, such as moss or mondo grass. The effect for the viewer is of a little island of green with its protruding, diminutive "mountains."

Other than the bamboo and the moss, the only plant material in the garden should be an asymmetrically placed evergreen—a small, broadleaved shrub or a very dwarf hemlock (that grows low and slowly)—always kept in scale by judicious pruning. Stepping-stones, successively smaller the farther they are from the viewing point, will give perspective and suggest a path leading off into the distance. The only human-fashioned artifact added to the garden scene thus created might be an authentic Japanese stone lantern of tasteful scale and form.

Such are the simple elements of a classic Japanese garden, a fragment torn from nature's harmony—oasis of contemplation, delight to the eye. If your first effort seems unlikely to meet the high standards of *Book of the Garden*, be comforted. It isn't too romantic a notion to imagine that your sincerity alone will mollify that book's exacting author and keep your backyard from filling up with demons. ❧



There are good reasons . . .

HOW DO PLANTS GET THEIR NAMES?

Mildred Mathias

Reprinted from AMERICAN NURSERYMAN, November 1, 1981

Plant taxonomists are in almost everyone's doghouse. They are blamed for every misidentification and name change. They deserve at least part of this blame, because they have rarely attempted to explain to the public how they produce scientific names for plants, the international means of communication.

The most common question asked is, "Why can't we use common names?" Think of the confusion that ensues when I use a common name in English and my visitor speaks only Spanish. I say "oak" and he says "encino" or "roble."

However, we both understand *Quercus*.

Obviously, the same plant may grow in a number of different countries and may have received many common names. Conversely, the same common name may apply to many different plants. The common garden plantain, *Plantago major*, is considered a weed throughout the world. It has 46 English common names, 11 French, 75 Dutch and 106 German. The pansy has 40 to 50 English common names, such as kisses, Johnny-jump-up, garden gate and monkey-face, as well as names given in other countries where it is cultivated.

Mertensia virginica or Virginia bluebells, not to be confused with small bluebells, bluebells-of-Scotland or creeping bluebell (all members of the Bluebell Family), or with California, desert or Australian bluebells, or the bluebell also called prairie gentian.

The Linnaean System

How have plants received their names? Since people first used plants for food, medicine, clothing, fuel and shelter, they have used names for the purpose of communication. Each person knew only a few hundred plants; given a one-word name was adequate.

Many scientific names were derived from common names which have been in use for thousands of years, some of them even in today's two-name or binomial form. I remember an Amazonian jungle weed used as a broom for the dirt floors of the palm-thatched huts. Its scientific name, given to the plant by Linnaeus in 1753, is *Scoparia dulcis*, which is merely the Latin form of the Spanish common name, "escoba dulce," which in turn is a translation of the Quechua "nuchu-pichana." In all three languages the name means sweet broom, referring to its fragrance and use.

We no longer live in semi-isolated communities working with a few hundred plants; some crop plants are grown throughout the world, and international communication is needed.

Latin and Greek Names

Scientific names of plants are based on Latin and Greek, the languages used in early literature about plants. The first plant found in a group was given a simple one-word name.

For example, the Greeks called the plant now known as Grecian laurel by the one-word name, *Laurus*. But when other laurels were discovered on explorations, it had to be distinguished from its many relatives.

There were seven different laurels by the time Linnaeus wrote his account of the plants in the Clifford collection in 1738. To distinguish among these many laurels, the one-word *Laurus* was enlarged to *Laurus*

foliis lanceolatis venosis perennantibus, floribus quadrifidis diocis to contrast with *Laurus foliis lanceolatis perennantibus venosis planis, ramulis tuberculatis cicutricubus, floribus racemosis* found in Southeastern United States.

These names leave something to be desired when they have to be used as a means of communication. Fortunately, Linnaeus felt likewise, and in 1753, when he instituted the binomial system, he shortened these to *Laurus nobilis* and *Laurus indica*, the latter now known as *Persea indica*.

Sometimes plants are named for people. Linnaeus named *Commelina* with its two bright blue petals and one insignificant white petal for the three Commelin brothers, two of whom were prominent botanists while the third was the family black sheep. He named *Siegesbeckia orientalis*, a sticky, stinking weed, for his fellow countryman Siegesbeck, who severely criticized Linnaeus for his plant classification system.

It is fun to look at surrounding plants and study their scientific names, which are sometimes informative, sometimes misleading and sometimes humorous. In my garden there are *Pittosporum rhombifolium*—meaning sticky seed and rhomboid-shaped leaves; *Osmanthus fragrans*—meaning fragrant flowers; *Platanus racemosa*—a classical Latin name for the genus and *racemosa*, referring to the flowering arrangement in racemes; *Calliandra haematocephala*—meaning beautiful stamens in red heads; and *Arbutus unedo*—two Latin common names for the same tree.

Origins of Plant Names

How does a taxonomist decide on the name of a plant? For the name of a genus he must have a Latinized form of a noun.

Generic names may be:

- Latin or Greek common names—*Ficus*, *Quercus*, *Acer*, *Pinus*.
- Names honoring people—*Fuchsia*, *Blighia*, *Sequoia*.
- Names coined from Latin or Greek which describe the plant—*Chrysanthemum*, *Spathiphyllum*, *Philodendron*.
- Aboriginal (native) names—*Sassafras*, *Aralia*, *Ginkgo*.
- Poetic or fanciful names—*Nymphaea*,

Greek nymphs or maidens rising from the water.

- Anagrams may make an unusual name—*Pandorea* and *Podranea*; *Allium* and *Muilla*.

- Additions of prefixes and suffixes—*Neomarica*, *Pseudopanax*, *Cupaniopsis*. Manufactured names for hybrid genera—*Amarcrinum* or *Crindonna* (*Amaryllis* \times *Crinum*), *Fatsihedera* (*Fatsia* \times *Hedera*).

A specific name may be:

- Descriptive—color, size or shape, abundance, habitat, uses, other characteristics, or a combination.
- Geographic.
- A generic name used in apposition.
- Commemorative.
- A noun used in apposition, often a native common name.

Specific names agree in gender with the generic name, but it usually takes a classics scholar to settle arguments about endings. It is best to follow a standard reference.

International Codes

Names of plants can be most informative. When I hear the species name *ecklonii*, I am fairly certain that the species is a native of South Africa, where Ecklon made extensive plant collections. When I hear the specific name *canariensis*, I can be fairly certain that the plant is a native of the Canary Islands.

But one must not become too confident. *Salix babylonica* is from China and not from Babylon. *Mesembryanthemum maximum* is not the largest of the genus. *Coinioselinum chinense* is from the Genesee Valley in New York and not from China; the collector's handwritten version of "Genesee" looked like the word "Chinese" to botanists.

Not only do we have rules about the forms of names, but there is an international code that governs such things as the applications of names and their publication.

Why then do plant names get changed? Species of plants are now named and described according to a set of rules known as the International Code of Botanical Nomenclature. Cultivars are named according to the International Code of No-

menclature for Cultivated Plants. Unfortunately, these sets of rules have not always been applied internationally. As a result some names of plants have had to be changed.

One of the most basic and obvious rules for naming plants is that the same scientific name cannot be applied to more than one genus, and within the genus, two species cannot have the same name. Yet prior to modern communications systems, this was a frequent event. Certain descriptive names have been used over and over in the same genus. In the worldwide genus *Eugenia*, the name *Eugenia microphylla* has been given to very different plants from China, the East Indies, Cuba and Santo Domingo. The name *Eugenia micrantha* was given to plants from Ceylon, Guatemala and Colombia.

Obviously, duplicate names are useless for purposes of communication. According to the rules, therefore, the name *Eugenia microphylla* can be used only for the first species to which it was applied, and the other three species must be renamed. Sometimes the same species has been named two or more times by different botanists. In this case, the oldest name is the one to be used. These examples illustrate two reasons for name changes.

Misidentification

Even now it is not easy to find out if a name has been previously used, particularly in large, widespread genera. In spite of catalogs and indexes that provide up-to-date information on newly published names, occasionally the same name is applied to two different species of a genus or a species receives two names. The number of new names proposed for species of flowering plants still exceeds 10,000 a year. So it is difficult to be totally current.

One of the most common reasons for name changes of nursery stock is misidentification. For years California nurseries listed both *Acacia longifolia* and *Acacia latifolia*. However, what has been carried under *A. latifolia* is only a broad-leaved selection of *A. longifolia*. No true *A. latifolia* is in the trade. Both are correct names, but *A. latifolia* is being applied to the wrong plant.

Knowledge Requires Change

Botany is not a static subject. As knowledge increases, name changes become necessary to reflect new information.

For example, in California there are two redwoods—*sempervirens* in the coastal ranges and *giganteum* in the Sierra. For years they both were included in the genus *Sequoia*. Some time ago a very critical botanist studied these two species intensively and concluded that they were not as closely related as had been thought, and each species was placed in its own genus—*Sequoia sempervirens* and *Sequoia-dendron giganteum*.

Further study and exploration may reveal that there are so many intermediates that plants known as several species become merged into one. Such a case is *Syzygium paniculatum*, which includes the plants formerly known as *Eugenia myrtifolia*, *E. hookeri* and *E. paniculata*. Names are not changed according to the whims of the botanist but to comply with international rules, to correct misidentifications and to reflect new knowledge.

There are rare occasions when, in spite of rules, a plant may have two legitimate names depending on differing opinions of specialists. Oregon-grape may be called *Mahonia aquifolium* or *Berberis aquifolium*, depending on whether one considers

Mahonia and *Berberis* a single genus with two subgenera or two separate genera.

Cultivar Names

The nurseryman has been guilty of confusing nomenclature by placing Latinized names on cultivars that he has selected or on unidentified plants. Thus *Carissa prostrata* is properly *Carissa macrocarpa* 'Prostrata', and *Chamaecyparis ellwoodii* is *C. lawsoniana* 'Ellwoodii'.

The species is a basic unit of classification. Closely related species are placed together in a higher category, the genus (plural genera). The nurseryman is usually dealing with subspecific units, the cultivars, because they are useful variations in the garden. A series of forms may be selected by cuttings and perpetuated vegetatively. Consequently, in the nursery the correct botanical or scientific name of such a plant will be a polynomial, such as *Camellia japonica* 'Chandleri Elegans'.

Why

It is important to use correct scientific names because they are an international language for communicating about plants. If people use these names just as they already use the names *Dahlia*, *Eucalyptus* and *Philodendron*, these names will soon become a convenient part of their vocabulary. ❧

Grubs and Grass

Reprinted from OHIO REPORT, July–August, 1981

The grub or larval form of the pesky Japanese beetle is tough on turfgrass. A greenhouse study in the USDA Japanese Beetle Laboratory at Ohio Agricultural Research and Development Center showed that two larvae in a 6-inch pot of Kentucky bluegrass could reduce grass growth nearly 50% by eating the roots.

If water supply was short, damage was worsened because of the double stress. Only one larva per pot (equal to five per square foot of soil in the field) cut bluegrass yields by as much as 30%. Further, the research suggested yield reductions up to 50% could occur without visible indications of turf damage or death.

The scientists report that turf damage often does not show up unless 100 or more larvae are present in 10 square feet of soil or unless another stress condition occurs. Populations of 40 to 80 grubs per square foot of turf are not unusual. Research indicates that an experimental larvicide is effective for controlling Japanese beetle larvae. However, the material has not been registered for use on turfgrass. ❧



McKana hybrid columbines

With less water for the garden choose . . .

PERENNIALS FOR THE DRY YEARS

Robert S. Hebb

Slightly condensed with permission from *HORTICULTURE*, June, 1981

Several years ago, while collecting plants for the New York Botanical Garden in dry steppe regions of Soviet Central Asia close to the borders of Afghanistan and China, I realized just how drought resistant some perennials can be. Much of this region does not receive a drop of rain between the beginning of May and the end of October, and here in mid-August were the wild ancestors of our garden yarrow, hollyhock and globe thistle in full bloom,

seemingly oblivious to their parched surroundings. In the same area were gas plants, peonies, poppies, ornamental onions and numerous tulips—their blossoms long gone and the foliage dry as straw, but able to survive due to fleshy root systems or bulbs that store water and nutrients when the water-losing parts above the ground disappear by midsummer.

The Eurasian steppes, North American prairies, seashores and mountainous areas

of the world have given us a wonderful array of garden perennials that have adapted to cope with reduced moisture during parts of the growing season. Selection of these, combined with easily performed cultural techniques and siting factors, may be the key to overcoming the drought years predicted to lie ahead. Even if the drought does not fully materialize, the gardener will be rewarded with a considerably reduced maintenance burden if drought-resistant plants are grown.

Location of the garden, correct placement of plants within it, and adequate soil preparation are all crucial for success. Although many perennials require full sun (at least six to eight hours a day), avoid a western exposure that guarantees maximum heat during mid- and late afternoon. Shade from trees, buildings or walls at this time of day will conserve untold amounts of water. Windswept sites increase transpiration, and sloping terrain drains water away from plant roots.

Trees may be a mixed blessing. Surface rooters such as maple and beech rob the soil of nearly all moisture and nutrients, and few perennials tolerate such conditions. Oaks have deep root systems and provide excellent high shade, while small trees such as dogwoods, stewartias or birches can provide a focal point without providing excessive competition. In a shady border or woodland garden, Carolina hemlock (*Tsuga caroliniana*) provides far less root competition than Canadian hemlock (*T. canadensis*).

A perennial flower border at the base of a stone wall or fence will be protected from drying winds and receive shade during the heat of the day. However, unmortared stone walls provide ideal homes for destructive rodents. A narrow path in front of a wall or fence at the rear of a wide border will make weeding and other maintenance chores much easier.

Some perennials that ordinarily tolerate full sun if soil conditions are rich and



Oriental poppies (*Papaver orientale*) are flamboyant in late spring. Becoming dormant in summer, they rank with the most drought-resistant perennials.

evenly moist adapt to somewhat drier conditions if light shade is provided. Among these are lady's-mantle (*Alchemilla*), blue-star (*Amsonia*), Japanese anemone (*Anemone x hybrida*), columbine (*Aquilegia*), goatsbeard (*Aruncus*), peachleaf bellflower (*Campanula persicifolia*), snake-root (*Cimicifuga*), Chinese bleeding heart (*Dicentra spectabilis*), cranesbill (*Geranium*), daylily (*Heemerocallis*), coralbells (*Heuchera*), loosestrife (*Lysimachia*), summer phlox (*Phlox paniculata*) and meadow-rue (*Thalictrum*).

One might assume that a way to combat the drought would be to plant in an area with a naturally high water table. Such a solution will lead to outright disaster with most perennials. Excessive water at the roots in winter will lessen the hardiness of many plants, cause the fleshy roots of others to rot, and cause still others to heave out of the ground during alternating periods of freezing and thawing. The few perennials that truly thrive in moist or wet soils include: goatsbeard (*Aruncus*), masterwort (*Astrantia*), marsh marigold (*Caltha*), turtlehead (*Chelone*), mallow (*Hibiscus*), yellow flag (*Iris pseudacorus*), gooseneck loosestrife (*Lysimachia clethroides*), purple loosestrife (*Lythrum salicaria*) and globeflower (*Trollius*).

The first line of defense against drought consists of adequate soil preparation before planting. For perennials, this means incorporation of liberal amounts of organic matter such as garden compost, peat moss, leaf mold, or well-rotted manure (cow manure is better than horse, which is better than chicken). It is impossible to use too much organic matter, and deep incorporation should be the rule. Although the rototiller has largely replaced the older method of double digging, this latter, somewhat more laborious practice incorporates organic matter deeper into the soil, thus encouraging moisture retention and more deeply rooted plants.

Summer mulches are a must during dry periods. They should be applied 1 to 1½ inches deep before the soil has dried out.

For all but the smallest perennial border, many mulches available at the garden centers—such as peat moss, sugarcane or buckwheat hulls—could easily bankrupt the average gardener. Woodchips are coarse and decidedly better around shrubs and trees. Sawdust is available in some areas and provides an excellent inexpensive mulch. Shredded oak leaves are still better, but one must possess a shredding machine. Mulching with lawn clippings is a somewhat questionable practice, because they soak up much of the moisture from midsummer rains, leaving little for the plants. Coarser dried straw, hay or pine needles also make excellent summer mulches. Spacing perennials so that their leaves just touch at maturity is another sort of mulch that prevents exposure of the soil to drying sun and winds and diminishes competition from weeds all at the same time.

When water is available in drought periods, people seldom use it wisely. It is far better to irrigate once, and deeply, than several times lightly. One inch of water applied evenly to a well-mulched garden of drought-resistant perennials is sufficient to bring them through three or four weeks without rain. Repeated light watering encourages shallow rooting, thereby lessening drought resistance. Frequent hoeing or cultivation causes precious soil moisture to be lost.



Japanese anemones will tolerate drier conditions if planted in light shade.

The Platycodon or balloon flower grows slowly but satisfactorily in well-drained soil, lasting up to twenty years without division.



The Dozen Best Drought-Resistant Perennials

Assume that we are to face several years of drought, with water rationing in urban areas and wells running dry in the country. If you are willing to incorporate adequate organic matter to the soil, mulch during the summer, and do the other things recommended here, the following twelve plants will provide the longest season of bloom, possess enough variation in height and color to make an interesting garden, and survive the summer with little or no watering. As an extra bonus, none of the following plants suffers from a serious insect or disease problem.

Achillea 'Coronation Gold', yarrow. Robust 2½- to 3-foot plants produce large mustard yellow flowers that contrast handsomely with the finely divided gray-green leaves. A succession of blossoms from June through August can be maintained if seed formation is prevented. The flowers are excellent for cutting and easily dried for winter arrangements. Plants must have a position in full sun, with average soil, somewhat on the dry side. Rich or moist conditions promote weak growth and inferior flowers. Recommended spacing is

12 to 15 inches apart. Divide and replant every fourth or fifth year.

Asclepias tuberosa, butterfly-weed. Bright orange flowers appear in umbels for two to three weeks in July on rugged 2- to 2½-foot plants. Butterfly-weed must have a place in full sun, with well-drained soil. Once established, plants will require no attention and will live almost indefinitely. They possess thick, fleshy taproots and resent disturbance. Buy butterfly weeds as potted nursery plants grown from seeds or cuttings; never dig them from roadsides, as wild populations are declining in many areas and transplanting is always a risk. Space 18 inches apart or singly.

Cassia marilandica, wild senna. This infrequently-used native plant produces a profusion of bright yellow flowers in three-inch clusters in August. It reaches a height of three to four feet, with fine-textured compound foliage that remains attractive throughout the season. It is a wonderful plant for the rear of the border in full sun or light shade. Soil should be light and well drained. Wet soil will lead to the rapid death of this otherwise long-lived perennial. Grow as a single specimen or as a group spaced 2½ feet apart.

Coreopsis verticillata, threadleaf coreop-

sis. Plants grow rapidly into dense clumps about two feet tall and two to three feet wide and bear a profusion of small, yellow, daisylike flowers through most of the summer. The foliage is finely textured. Plants must be grown in full sun and relatively dry soil and should be divided after four or five years. Space two feet apart.

Echinops 'Taplow Blue', globe thistle. The three-inch steel blue, thistlelike flower heads have a silvery cast and appear in August. Plants form dense, bushy clumps four to five feet tall. Although tolerant of partial shade, full sun always gives best results. Soil must be well drained but not especially fertile. The flowers are excellent for cutting, dried arrangements, and for attracting bees. Staking is not required, and division will not be necessary for many years. Grow as single specimen, or as a large group with individual plants 2½ to 3 feet apart.

Eryngium amethystinum, amethyst sea-holly. This is a thistlelike plant whose flowers, bracts, and upper stems are steel gray, shading to amethyst in July and August. The leaves are deeply cut and spiny. Plants resent disturbance and require a place in full sun with good soil drainage. They impart a bold but not coarse effect to a border and produce flowers and foliage that are excellent for drying purposes. Sea hollies are usually best grown as single specimens.

Gaillardia 'Baby Cole', blanket flower. This plant must have well-drained soil for optimal hardiness. It is the lowest growing of the blanket flowers, only six inches, and thus the usual sprawling problems of this group are avoided. The daisylike, bright red flowers tipped with yellow appear through most of the summer. Space plants 12 inches apart in groups of three or more.

Papaver orientale, oriental poppy. Oriental poppies overcome the heat and drought by going dormant in summer, the leaves reappearing in autumn. They are bold in appearance, two to four feet tall when in flower, with coarse, hairy, lobed leaves. Clumps eventually expand to a yard or so in width and must have excellent soil drainage in winter, with full sun to partial shade in summer. There are a number of striking cultivars.

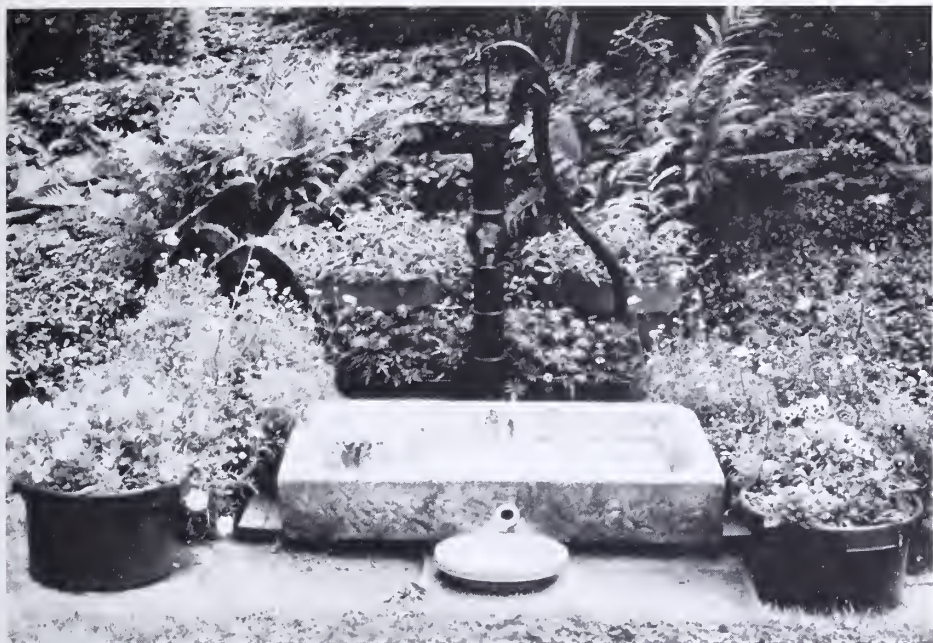
Platycodon grandiflorus* var. *mariesii, bal-

loon flower. Handsome bright blue flowers from late June through July are freely produced on compact 18-inch-tall plants. Because of the thick, fleshy roots, plants resent disturbance and must not have wet soil in winter. New clumps are slow to increase, never become invasive, and last for twenty or more years in good conditions. Ample organic matter in the soil is the key to good performance in drought. Full sun or light shade are equally satisfactory. This variety is shorter growing than other balloon flowers and thus does not require staking. Space plants 12 to 15 inches apart in groups of at least three.

Rudbeckia fulgida 'Goldsturm', cone-flower. This wonderful selection represents its wild cousin, the black-eyed Susan, to perfection in the perennial border. The three- to four-inch flowers are produced freely on well-branched, 2½-foot plants from mid-July through September. Full sun is essential, and ample organic matter must be incorporated into the soil. Although it will resist drought in such conditions, poorer soil will produce disappointing results. The long blooming period makes worthwhile the extra effort to prepare the soil. Space plants 12 to 15 inches apart in groups of three or more.

Sedum 'Autumn Joy'. This hybrid is the finest of the autumn-flowered *S. spectabile* group. Pale pink when coming into flower in September, salmon by October, and russet after the hard frosts of November, the flowers last the longest of any autumn-blooming perennial. The two-foot plants are excellent as single specimens or spaced 18 inches apart for massing. A position in full sun will produce the best effects, but light shade is acceptable as well.

Tradescantia virginiana, spiderwort. A nearly indestructible plant with a long bloom period, it tolerates sun, shade, flood or drought. It survives in spite of what the gardener may do, but if encouraged by overly rich soil, it may become a pest. In dry situations, plants may become tatty in appearance by midsummer. Cut them back to ground level for a second flowering in autumn. The plants attain a height of about two feet and may be used singly or grouped about two feet apart. The three-petaled flowers in variations from blue to lavender or white appear in small clusters. ❀



Containers with stone sink and pump

Pleasures and pitfalls of . . .

GARDENING IN CONTAINERS

Frederick McGourty

Reprinted from AMERICAN HORTICULTURIST, June, 1981

Container gardening outdoors began for me about twenty years ago when I started to grow a few annuals in redwood boxes. My initial color choices weren't especially good—hot pants-pink petunias, orange zinnias and that sort of thing, but like most people who grow annuals I was interested in bright hues. It didn't really matter then if the various combinations shattered an occasional pair of sunglasses. That was the pre-pastel period of my gardening. I am sure I would have been drummed out of the local garden club.

In addition to my lapses on color coordination, I was but dimly aware that plants had different heights and that scale was not just an insect. Fortunately, giant sun-

flowers never appealed to me or I would have put them in containers, but there were a number of flops. One was *Salpiglossis*, which is a Texas-sized relative of the petunia, though it sounds more like a throat malady than a plant. It was only three inches tall when I bought it in a little tray from a garden center one Memorial Day, the traditional planting-out time for annuals in the Northeast. Within six weeks the two-foot-tall *Salpiglossis*, laden with bloom and weak of stem, followed Newton's Law. I scooped up the plants much like a dancer trying gracefully to hold his leading lady who has suddenly fainted. Stakes and strings didn't help much. *Salpiglossis* was in a five-inch-wide, five-inch-

deep metal window box, and one, moreover, that had no drainage holes. By the first of August Old Salpi, top-heavy and soggy-rooted, had given up the ghost, and American horticulture was the richer.

The metal window boxes held a certain fascination for me, mainly because they were cheap, light in weight and lasted a few years if protected from winter. They came in various lengths, too. I amassed one of New England's finest collections. After awhile it occurred to me to use an ice pick to punch a few holes in the bottom for drainage, and plants grew better, even those rare ones that like the moist side of life. Why the manufacturers don't make the holes at the point of origin remains a mystery, for it would save gardeners a lot of woe.

Water

In gardening one seldom has it all one's own way, and it became clear to me that the smaller the container, the greater the need is for watering, regardless of whether the currently popular chemical super-absorbents are mixed with soil or a mulch is placed on top. Summer drought is a more common occurrence than we like to think, and even with normal rainfall it is necessary, in the cooler reaches of the country, to water a metal window box at least once or twice a week. In warmer areas daily watering may be necessary, especially if plants are in full sun, as most annuals should in theory be. Man cannot garden by theory alone, however, and to cut down on the seemingly constant watering I learned the desirability of setting containers where they would receive morning sun and afternoon shade, since the summer sun from lunch time on is brutally drying. I am neither mad dog nor Englishman, nor are my plants.

In cities, where heat concentrations are greater, the matter of site is particularly important. In many instances the experienced urban gardener essentially looks upon shade from tall buildings not so much as a problem but as an opportunity. If shade seems to come from all sides but light is fairly good, the container gardener can always rely on the Big Three of the shade-tolerant annuals—wax begonias,

impatiens and coleus. Luckily, each has many strains and colors from which to choose. Also, the gardener doesn't have to constantly remove the spent flowers to make these plants look tidy or to perpetuate bloom, as is the case with most other annuals.

It was in fact a miscalculation with impatiens that led me to dreams of glory with container gardening. Each spring for some years I bought a tray or two of impatiens to plant in compost in two large cement window boxes located under an old ash tree. My custom was to plant, water and mulch them at the end of May, then return in late September to uproot them after the first frost had turned them to mush. They performed beautifully, and little or no watering was necessary, since they were shaded and the summers in our northern Connecticut village are cooler than in most areas. I thought container gardening was a cinch and couldn't understand why entire books had been written on the subject (mainly by Californians and/or city dwellers)!

Therefore, one winter I bought every window box on sale at every discount store in our part of the state, accumulating, to my wife's great horror, more than a hundred, which were placed on mostly sunny stone walls all over our property. The next summer was spent running about with hose and watering can, and we skipped the beach. By the end of July the petunias were peaked, and so were we.

Fortunately, there is a season called winter and it is a time in the northland for reflection, or less kindly put, for figuring out what went wrong and to resolve never to let it happen again.

Size

Bigger containers (and grouping them to ease watering) seemed to make sense. By this time I decided to move up. Redwood tubs were out of the question because, while they are durable and attractive, they were beyond our budget, at least for the scale on which we wanted to garden. Also, Mary Ann objected to my scrounging through the greengrocer's garbage to retrieve bushel baskets (which don't make bad containers for a season if the interiors



The two cement window boxes, now on a stone wall and filled with impatiens to brighten a shady spot.

are partly lined with black plastic (polyethylene).

Necessity is the mother of invention, and invention is the mother of discovery. In my wanderings through the discount stores I noticed that there were kitchen departments as well as gardening ones. The large, flexible plastic dishtubs which sold for \$1.98 were ideal for my purposes, and I invested in a century's supply. They had no drainage holes either, but by this time I had become skilled with an ice pick, and this posed no problem. The tubs had two key assets apart from size—they were lightweight, and the plastic kept down evaporation. By good chance most of them were dull brown and would not steal the thunder from the plants. Mary Ann was lukewarm toward the tubs, and acidulous toward the few Kelly green ones that crept in during my zeal to corner the market. Actually, they were a chlorotic Kelly green and could have stood a shot of iron chelates. However, I assured her that we would plant euonymus vines around the base to soften their harshness. By and large they worked well, though one visiting landscape architect peered through the

camouflage and asked sweetly, "Do you take in laundry too, Mr. McGourty?"

Furry Folk

Rabbits forced us to increase our container gardening efforts. Our vegetable garden had been in a scrubby old pasture, which apart from the driveway was the only area of our property receiving all-day sun—a requirement for the best growth of food plants except the leaf crops (lettuce, chard, etc.). One year the pasture suddenly became a scene from *Watership Down*, with rabbits camped out every few feet, within hopping distance of the carrots. They even intimidated the woodchucks, who were also eyeing the carrots.

The logical response would have been a fence around the vegetable garden. I objected on aesthetic grounds, since old pastures in New England aren't meant to be cluttered, regardless of Robert Frost's comments about good fences and good neighbors. It struck me that the ideal spot to put the vegetable garden was at the end of the driveway—in containers. This was based largely on the theory that rabbits don't climb.



A dark brown, flexible dishtub put to good use. Behind, on a low pedestal, is a cast iron urn painted white.

We located a half-dozen good-sized, wooden packing crates and put two tomato plants in each, along with stakes cut from ash saplings in the nearby woods. Mary Ann marveled at my optimism. The stakes were nine feet tall, and even by the end of summer the tomatoes hadn't reached the top. The driveway resembled 19th-century Salem harbor with its masts shorn of sails.

There is one thing we learned about tomatoes: they are drunkards. Their thirst exceeds that of any other vegetable, except possibly cucumbers, which nature did not intend for little window boxes. We never needed a thermometer in summer because the tomatoes would tell us when it was more than 85°F. How well I remember the words, "Darling, the tomatoes are gasping again. Be a dear and give them a drop from the hose!" Half an hour later, after musing about tomatoes and how they learned from the old-time boxer called Fainting Phil Scott, who won his fights by

dropping to the canvas shouting foul, I would wind up the hose and wash myself down. Today a lot of greenhouses have miniature hoses aptly named spaghetti tubes, which run from a faucet to a central hose to individual containers. This would make a lot of sense adapted to the driveway vegetable garden, but then I wouldn't be able to think about Fainting Phil anymore. And spaghetti tubes aren't the prettiest system, either—even with sauced tomatoes.

Not all of our metal window boxes have rusted away yet, much to Mary Ann's disgust. We inherited several old tables which wouldn't be much the worse for wear if left out during summer, and on these were placed boxes for green peppers, lettuce, eggplants and mini-carrots. Seed catalogs these days list a number of compact-growing varieties especially suited for containers. However, extra space was needed, so a couple of sawhorses and



Still giving good service, the window boxes now hold salad greens and herbs on an old table, elevated away from rabbits.

sturdy planks were added for more containers. Not a rabbit bothered to climb.

Our only problem in the driveway was with a raccoon, who one September evening raided the melons just as they were coming to the desired point of ripeness a few days before frost. Regardless of the catalog talk, it is hard enough to grow melons in Connecticut because of cool summer nights and a short growing season, but like all home growers we felt like gambling a bit. Seed had been started indoors under artificial light in April, young plants moved to wooden boxes in the driveway at May's end and protected against cutworms by collars cut from paper cups. In the first couple of weeks a tarp of black plastic had been placed around the boxes to reflect heat. The crop itself exceeded our dreams—23 beautiful muskmelons on their way to perfection. Then, the raccoon struck, taking a single bite from each. We consoled ourselves with the thought that he might have developed a bad case of diarrhea later that night.

Melons, in fact almost every kind of container-grown plant, require some form of fertilizing as the season goes by, mainly

because the frequent waterings wash away nutrients in the soil. We used to apply a water-soluble fertilizer every three weeks, and still put it to work occasionally on an recalcitrant plant, but the special slow-release fertilizers that are mixed into the soil just before planting time save a lot of time and effort. No additional fertilizing is needed in the course of the summer. The slow-releasers are not inexpensive themselves, but they allow us more hammock time than we used to get.

Soils

There appear to be as many soil (or soil-less) mixes for containers in America as there are gardeners. Specialty formulations (University of California, Cornell mix) exist, mainly for the commercial grower, but can be adapted in the home garden. The city dweller might find it easiest to use a good grade of bagged potting soil with equal parts of coarse sand and peat, or to use an entirely soilless mix. The latter is particularly useful for hanging baskets because of its light weight, but special attention must be given to fertilizing and watering. Such mixes are more-or-less free

of soil pathogens. They are based essentially on equal parts of ground peat moss and vermiculite and/or perlite, with a trace of dolomitic limestone. Our own mix is uncomplicated. It consists of year-old compost that is approximately three-quarters decomposed, a shovelful or two of coarse builder's sand per wheelbarrow-load, a cup of lime and a half cup of superphosphate, since our soil, like most in the Northeast, is deficient in phosphorus, an element that encourages good flowering.

Unamended garden soil itself is not satisfactory for containers because it almost invariably lacks the proper structure. If it is used in conjunction with peat and sand, it is best pasteurized first. Pasteurization, incorrectly called sterilization in many garden books, can be accomplished in small quantities by cooking the moistened soil in a 200°F oven for one hour. Close the doors and open the windows—there are nicer scents in the world than roasting soil. Also, it is a good practice to change the soil in garden containers every year.

Choice Flowers

All sorts of garden annuals, and some perennials such as the hardiest, most rugged sedums, lend themselves to container use. Low height and compactness, or trailing nature, are important, and if you are just getting started it would be well to turn to a source such as the Brooklyn Botanic Garden Handbook, *Gardening in Containers*, guest edited by George Taloumis. It is available by mail for \$3.05 (includes postage) from the Garden, 1000 Washington Ave., Brooklyn, NY 11225.

Every container gardener has favorite annuals, including some which may be very different from the ones used in flower beds. Creeping-zinnia (*Sanvitalia procumbens*), a little yellow daisy with a prominent, dark eye, is a plant that comes into its own in containers, as does another miniature study in yellow, the Dahlberg daisy (*Dyssodia tenuiloba*). Both are nice with the electric blue of *Lobelia erinus* 'Crystal Palace Compacta' or the softness of *Lobelia* 'Cambridge Blue'.

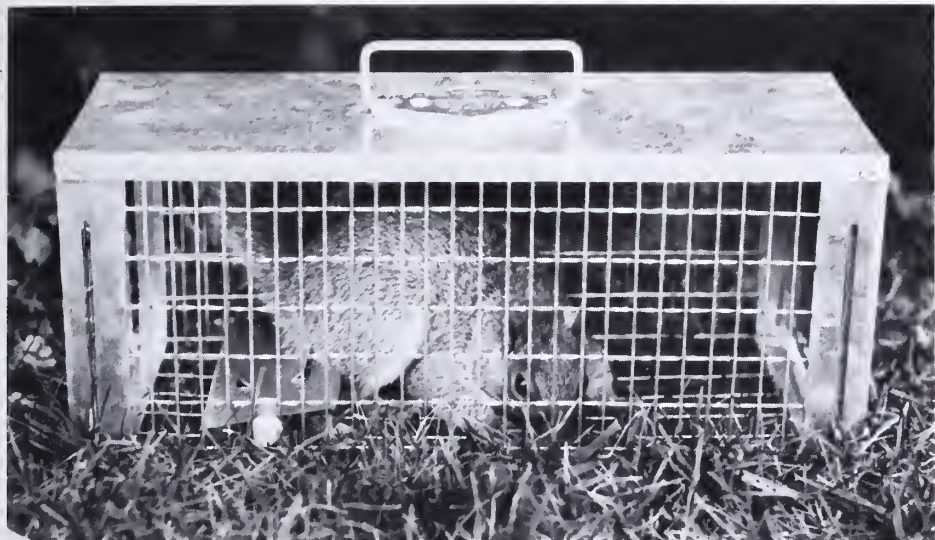
We also like to start a container or two of Virginia-stock (*Malcolmia maritima*), the flowers of which resemble arabis. They may be pink, lilac or white, and plant

height is only a few inches. Virginia-stock, like sweet-alyssum, flowers in just five or six weeks from seed sown directly in the container. The bloom period lasts only a month or so during the heat of summer, but if seeds are started by August 1 a long display may be had during the cool days of autumn. One year I noticed that a November temperature of 17°F had not spoiled the flowers. Ornamental ("flowering") kale (*Brassica oleracea*) is one of the few other annuals that can tolerate such frost and look well in late fall. Snapdragons persist, too.

Extending the season is important for anyone living in the cooler regions of the country, and container gardening can be singularly useful in this respect. Not only is it possible to hide the evidence if a container is in crisis and your mother-in-law or a landscape architect happens to be coming for a visit, but it is also easy to grow fall bloomers such as cushion chrysanthemums in containers that are out of sight, perhaps on a distant stone wall, then bring them to the terrace or porch as they start to bloom. The flowers last a surprisingly long time, and if heavy frost threatens it is no difficult task to place an old blanket over them, especially if the containers are grouped. Chrysanthemums cannot safely be left in containers in the open over winter in the North. We put them either in a cold frame or, removed from pots, into the garden. Evergreen boughs are placed on top after the ground freezes. The survival rate is as a rule quite high with cushion mums, which are among the hardiest of the breed.

Finally, good grooming is important because containers are usually placed in conspicuous positions—by steps, doors or terraces. Spent blossoms should be removed several times a week. If some leaves are marred or scorched, remove them. Make sure containers are not beyond the reach of the hose! Certain annuals such as petunias look worse for wear as summer progresses. Pruning them back halfway, then feeding and watering them heavily, works well, but it makes aesthetic sense to get the containers out of sight until revival takes place.

Experiment with container gardening this year! 🌸



Winsome but destructive

THE TROUBLE WITH SQUIRRELS AND SKUNKS

George Taloumis

Reprinted from FLOWER AND GARDEN, August–September, 1981 *

Gardeners in the city, country, and suburbs are all troubled by animal pests. Perhaps you are among them. The pests may be of a number of different kinds. Squirrels and skunks head the list if you are trying to grow Dutch bulbs.

The common gray squirrel, which is the most numerous kind in my area and many others, makes a pest of itself by digging up plants in search of acorns or fungi. He may go after the spring bulbs you just planted—loosened soil and bone meal will lure him to the spot—or he may wait until spring and nibble off the buds of crocuses and snowdrops after you have waited all winter for them to bloom. This is only an example, for squirrels may also choose to eat other delectables such as carnations, which one season were so preferred by them in my garden that I gleaned only one bloom, a gorgeous red one, for myself.

Squirrels are almost impossible to keep

away from your bird feeders. And if they get into your attic, as they did into mine for two winters, you will awaken at all hours of the night and early morning to hear them gnawing on the acorns they have stored, or chasing one another in gleeful frolic.

It was only after the attic was insulated that they disappeared. Plus trapping. To this day, after starting in the fall of 1978, I have accounted for sixty-one in live-animal traps. During stretches of this time, none have been trapped. For example, No. 57 was snared on May 13 last year, and then the trap was put away and not brought out until the first of July when more squirrels were spotted. Trappings on July 2, 9, 10 and 11 brought the total to sixty-one up to the time I wrote this, July 19.

... And Skunks

If there are skunks about, at least you



Tulip bulbs sprout through chickenwire weighted with bricks to protect the bed from digging animals. Remove at this stage so annuals can be planted after bulbs are spent.

do not see them. Smell them? Of course, and early this morning was one of several such times this season. Fortunately, someone usually phones the police and soon the stink ceases. For digging up newly planted Dutch bulbs, skunks are worse offenders than squirrels, simply because they are larger and have more strength to dig longer and deeper. Unless you have experienced it, you cannot imagine the dismay at waking up a morning or two after planting bulbs at great cost and effort, and finding most of them—like 51 out of 85—dug up and nibbled here and there.

Trapping

My original idea was to get after the squirrels, since at first they were the only culprits I knew about. The trap I bought is one called Tender Trap. There are others of its type that catch small animals without harming them. It requires considerable experience to learn how to bait properly with peanuts. The peanuts in summer are secured with peanut butter—which the ants eat; or in winter they are anchored with clay, which hardens in the cold so either squirrels or birds such as starlings saunter in to work at them.

There are tricks you must find out for yourself, like placing the trap against a fence or other wall to shut off one side; holding it down with bricks so squirrels won't turn it over, and mostly placing a

brick close to the yellow knob at the side. If you don't, squirrels chew the knob in an effort to get at the peanuts, the door slams, and no squirrel.

Long, costly telephone conversations ensued with the Fish and Wildlife Service and the Massachusetts Audubon Society, as well as county and state agricultural experiment stations. I was told not to keep the squirrels too long (which I didn't); but if I couldn't release them immediately, to give them water. Take them five or six miles to release in a wooded area (which I did, always away from houses, and I always went six miles just to make sure). I was told to spray their tails or back sides with aerosol orange spray color (which I did) to see if any returned to their domain. To date, none have. In fact, after No. 50, I stopped spraying. One less thing to do.

A Perilous Problem

The first skunk, hardly expected, appeared in my trap on Sunday of a Labor Day weekend. Since I was expecting guests for a cookout, it had to be dealt with without delay.

The Animal Rescue League advised a quiet approach—cover the cage with a canvas so the animal would not become frightened, and take it gently to a distant spot along a road, open the trap door and hope it would rush out instantly as squirrels do. Not so. The trap had to be left

overnight before the skunk agreed to leave. All this was done not without trepidation on my part.

The second skunk, also unexpected, made itself known on Sunday of the Fourth of July weekend. Again I made frantic phone calls to two Animal Rescue Leagues who advised covering the trap and promised to come the next morning to release the animal—as I had no wish to go through the same trauma a second time. Their agent finally appeared at 3 P.M., with no clear idea of what to do, but the skunk had solved the problem by releasing himself. Jiggling the door, it had released the two inserts that hold the door closed; then it had dug its way out of the garden under my fence.

Some things I learned: skunks must lift their posteriors in order to spray the full amount, a distance of six feet. In a small squirrel cage they are not inclined to do this as they do not want to anoint themselves. If they do release some of their scent, it is a small amount. To avoid capturing skunks accidentally, place the cage on a table, since these animals do not climb (I forgot this point following the first episode). In any case, releasing a skunk is not difficult if you treat it gently and carefully.

Bulbs

Both squirrels and skunks will dig bulbs out, as they are attracted by soft and newly loosened soil. For this reason many books tell you to plant bulbs in wire mesh cages to protect them against digging animals. This process calls for much effort, expense and time, so I advise the easier method of placing pieces of chicken wire over the clumps and weighting them down with bricks or stones. This idea has worked for me in two replantings of bulbs that had been scooped out initially. Remove the wire and weights in early spring before plants can grow up through it. If you don't, you will not be able to get it up after bloom time when foliage is ripening and you wish to set in annuals to give color in that space through summer.

Squirrels, chipmunks or skunks are not likely to disturb bulbs once bulbs are established. The vulnerable period is right after they are planted, when the soil is soft,

and the odor of fresh bulbs plus fertilizers still pervades the place. The eating of flower buds is another matter—and one that brings rise to the need for trapping, to reduce the populations.

Foiling with Annuals

Further to prevent animal disruptions of established bulb plants, I like to set low-growing, shallow-rooted annuals over and between the bulbs, preferably while the foliage is ripening. At that time, you can see clearly what you are doing. Such plants may be started either from seeds, or from pre-started seedlings.

From seeds you can have kinds like sweet alyssum, portulaca or dimorphothea. Before planting seeds, loosen the soil with a cultivator, taking care not to go too deeply. Scatter peat, compost, shredded leaves or other organic material, and work it in. Then scatter a mixed fertilizer, such as 5-10-5, and work it also into the loosened soil. Thin the seedlings later, when seeds have all sprouted.

Similar soil preparation is essential before you set out pre-started seedlings, kinds like wax begonias, dwarf impatiens, verbenas, creeping zinnia, nierembergia, browallia, geraniums, or nigella.

When setting out seedlings, you can add fertilizer as you make the planting hole. Use a slender pointed trowel, and add half a trowelful of plant food (preferably a slow-release type) at the bottom of the hole. Scratch a little soil over it before setting the plant; then water.

For a continuous floral display from your above-and-between-bulb annuals, it is advisable to feed a second time. Needless to say, water as needed through the summer; pinch and prune such annuals as petunias and snapdragons to remove faded blossoms—not only to improve appearance but also to prevent seed formation. This way you can enjoy color in the bulb plantings from early spring to killing frost.

One final point in regard to bulb plants and marauding animals: daffodils (*narcissus*) enjoy virtual immunity from digging animals because the bulbs themselves are toxic and animals will not attempt to eat them. If circumstances are such that animals will keep the upper hand, go in for daffodils. ❀

BEST OF THE PIERIS

Pamela Harper

Since 1934 *Pieris* has been the botanical name for those shrubs popularly called andromeda, a name now belonging only to the dwarf, narrow-leaved shrubs called bog-rosemary by gardeners. Apart from mountain-laurel, *Pieris* has few peers as a broad-leaved evergreen for northern gardens, nor is it eclipsed by the camellias and azaleas of warmer zones, blending well with these in the light shade and moist (not wet) humus-rich soil that is preferred by most broad-leaved evergreens. Despite this preference *Pieris* grows surprisingly well in cities, and fine specimens can be seen even among the concrete canyons of Manhattan. *Pieris* is a member of the Heath Family and should be grown in acid soil. Most *Pieris* are slow growing, but not frustratingly slow, and need no pruning to keep them shapely.

Pieris blooms in early spring. The long-lasting clusters of flowers, white or pink pearls, bell-shaped and with clawlike bracts at the base, are but one of their attractions. The buds, greenish or red-tinged, are attractive through winter. New leaf growth in spring may be creamy, coppery, pink, dark or brilliant red. Winter foliage, in some, is darkest mahogany. Unfortunately there is as yet no one cultivar incorporating the best of all these qualities. Described here are some of the most select that are presently available.

Good Choices

Pieris floribunda. This, the only native species of ornamental merit, is also the hardiest (Zone 4). Three to six feet, handsome, densely mounded shrub with flower clusters more upright than in other species. A very pretty dwarf clone, 'Millstream', remains rare because it is difficult to propagate. Those lucky enough to acquire it are warned that it must have excellent drainage, or sooner or later it will be lost.

Pieris 'Brouwer's Beauty'. This is a hybrid between *P. floribunda* and *P. japonica*. It is hardier than the latter, in

appearance midway between the two with flower clusters arched-horizontal. Dense, compact habit.

Pieris formosa forrestii. In such good forms as 'Wakehurst' this is the jewel in the crown of the genus. Unfortunately, it is the least adaptable species, also the tallest, to twelve feet or more. Brilliant red new foliage and snowy bells larger than those of most *Pieris*. Not very hardy (Zone 8), and intolerant of high summer temperatures. Sometimes called flame-of-the-forest, but not to be confused with the next.

Pieris 'Forest Flame'. A hybrid between the above and *P. japonica*, somewhat less hardy than *P. japonica*, and almost the equal of its other parent for brilliance. Upright growth habit. Loses flower buds and suffers some dieback at around 6°F. A hybrid of similar parentage, 'Valley Fire', has hardier flower buds.

Pieris japonica (Zone 5/6). Glossier foliage than *P. floribunda*, and larger white flowers. New growth coppery. The species grows to about seven feet in ten years in the South, less in the North. Some of the following cultivars and hybrids grow more slowly, tending to be wider than high. 'Dorothy Wyckoff'. Upright habit. Buds mahogany. Flowers pinkish-white becoming white, with mahogany bracts. Outstanding mahogany-colored winter foliage when grown in sun. 'Flamingo'. Flowers deep pink, not as good as 'Valley Valentine'. 'Pygamaea'. Flowers white, none too plentiful, often lacking. Leaves tiny and narrow, not resembling a typical *Pieris*. Usually a small, dainty shrub for the rock garden, although 3 ft. height is known. 'Mountain Fire'. New growth red, with this color retained longer than other cultivars (two weeks). Flowers white. Upright habit. 'Red Mill'. New growth red. Lower habit than 'Mountain Fire'. Flowers white. Said to be exceptionally hardy. 'Variegata'. One of the loveliest variegated shrubs. Leaves narrowly-edged white, well-displayed white flowers. Hardier than



A pieris for southern gardens (Zone 8). *Pieris formosa forrestii* has glossy new foliage of deep red tinged with bronze.

Pieris taiwanensis (Zone 7). Very long clusters of white flowers, held more upright than *P. japonica*, less so than *P. floribunda*. New growth coppery. Seldom more than six feet high. 'Crispa' (some authorities ascribe this cultivar to *P. japonica*) has leaves with wavy edges.

Filtered shade is best for *Pieris*. In full sun lacebug damage to the leaves is probable in the East. In full shade (as against north walls) this seldom occurs unless moisture is lacking, but flowers may be fewer, foliage less bright. Lacebug is not difficult to control with methoxychlor but can kill or seriously weaken a shrub if ignored. The new growth of *Pieris* is very tender and vulnerable to late spring frost. High shade usually alleviates such damage. ♣

most *P. japonica* cultivars. Growth very slow at first, about 3½ ft. high, 2½ ft. across at twelve to fifteen years, then grows faster and in the South can attain twelve feet. 'Valley Rose'. Flower buds maroon, flowers pink, dusty pink with age. Growth habit wider than high. 'Valley Valentine'. Flowers deep pink and long lasting, the best of their kind, according to plant breeder Robert Ticknor. Buds maroon. Dense upright growth to four feet in ten years. Not yet widely available. 'Wada' ('Daisen' is similar, probably synonymous). Dark pink buds, paler pink flowers. Neat, low mounded habit, three to four feet in ten years. 'Christmas Cheer'. Similar to 'Wada'. Good growth habit. Good winter-bud color. In some areas gives a smattering of winter flowers. 'White Cascade'. Long, heavy clusters of pure white flowers.



Pieris japonica 'Wada' is neat and low-growing in habit. Dark pink buds opening to a creamy blush cascade in spring.

J&P'S ROOT-OF-THE-PROBLEM ROSE CHART

Reprinted from THE AMERICAN ROSE MAGAZINE, March, 1981.

A rose problem is almost always a reflection of the plant's environment. This chart, prepared by the rose firm of Jackson & Perkins will help you diagnose and treat possible problems.

Your local nurseryman or county agricultural agent will be helpful in recommending the proper spray or fungicide or in identifying a pest or disease.

	SYMPTOM	POSSIBLE CAUSE
CULTURAL PROBLEMS	New roses slow to start.	Plants allowed to desiccate (died out) before or after planting.
	New foliage dies, is stunted or off-color.	Excessive salts from over fertilizing.
	"Leggy" plants and few or no blooms. Blooms/buds fail to develop properly.	Location too shady or lack of food.
INSECT PROBLEMS	Curled leaves, possibly a sticky secretion, malformed flowers. Leaves spotted red, yellow or brown, possible loss of leaves.	Aphids—pear-shaped insect about half the size of a grain of rice. Usually green, sometimes red. Generally suck tender new shoots and leaves.
	Brown-edged flower petals, buds open partially or not at all. Buds/leaves turn black and die. Buds malformed.	Thrips—tiny, brownish insect with fringed wings. Attracted mostly to red and light-colored roses.
	Holes chewed in leaves and petals. Large, circular holes in leaves, wilted canes.	Japanese Beetle—about 3/8-in. long, identified by its metallic green body and copper-brown wings.
	Chewed leaves and/or buds. Drooping cane tips, wilted leaves.	Rose Budworm (Caterpillars)—there are 2 types: one is whitish-orange, about 3/8-in. long; the other is green, about 3/4-in. long. Chew buds and leaves in late spring.
DISEASE PROBLEMS	Dark black spots with a surrounding yellow area form on leaves. Leaves turn yellow-pink, fall off. White or grey powdery substance on leaf buds and canes. Early sign: leaves curl up.	Blackspot Disease. Prefers light shades such as yellow. Red roses are most susceptible. Caused by moisture.
	Rough, tumor-like growth near soil or on roots. Buds fail to open, turn brown, decay.	Crown Gall. A bacterial disease that often gains entry through wounds made by cultivating.
	Red-orange raised spots on underside of leaves. Leaves wither and drop.	Rose Rust. Mostly confined to western U.S. Occurs during periods of morning dew.

REMEDY	POSSIBLE CAUSE	REMEDY
Soak entire plant for 24 hrs. before planting. Keep canes moist after planting by shading with moist burlap, etc.	Insufficient water.	Prepare soil before planting by adding peat to soil—1 part peat to 3 parts soil. Soak, let percolate, resoak.
Use no chemical fertilizer around roots. Water heavily twice—1st to put salts in suspension, 2nd to leach salts from soil.	Insufficient water. Alkaline soil (in extreme cases this can kill plant).	Add peat and mound a basin around bush. Soak, let percolate, resoak. Add acid peats or soil sulphur; use acid-type fertilizers (if condition extreme, replace soil).
Plant in area where bushes receive at least 6 hours of sun a day, preferably in A.M. Supplement regular fertilizing with a liquid feeding.	Cool nights or dark, wet weather can result in half-open condition termed "balling".	Cut bloom as soon as it starts to ball to allow for new growth concurrent with improving weather.
Spray in spring 2 to 3 times at intervals of 2 weeks. Do not neglect underside of leaves.	Red Spider Mite—pepper-sized, spider-like sucking insect. Likes hot humid weather. When present, always on underside of leaves.	Spray in early spring and at weekly intervals thereafter. These insects develop quick immunity. May have to use different sprays.
Spray. Pesticide must come into contact with insect. Since thrips grow deep between petals, early identification and control necessary.	Rose Midges—tiny, winged, red or brownish insects. Lay eggs, larvae feed on buds and leaves. Most serious during June and in autumn on Hybrid Teas.	Spray bushes and ground thoroughly once a week during blooming season. Prune off and burn infested buds if feasible.
Hand-pick from plants and drop into container of kerosene or spray plants and soil weekly.	Leaf Cutter Bees—small, bluish-green bees, resemble flies, bore into canes.	General treatment for most borers is to prune well below affected area and seal pruning cut.
Pick off and destroy infested buds and leaves. Spray weekly when pests begin to feed.	Raspberry Cane Borer. Attacks canes 6 to 8 inches below tips. Larvae bore through canes into base below ground.	Prune infested canes well below infested area.
Spray every 10 days or after rain. Avoid overhead spraying.	Powdery Mildew. Usually occurs in periods of cool nights, humid days and no rain.	Spray with <i>lime sulphur</i> during dormant period in early spring. During growing season, spray weekly with <i>sulphur only</i> (as opposed to lime sulphur). Overhead watering helps reduce.
If present, prune off and seal wound. Disinfect knife before using.	Botrytis Blight. A fungus present in rainy weather in old blooms and winter-killed canes.	Pick off and destroy faded blooms. Spray weekly during wet springs.
Spray in early spring.	_____	_____



One alternative to turf . . .

WOOLLY THYME AS A LAWN

Daniel C. Weaver

Reprinted from BULLETIN OF THE AMERICAN ROCK GARDEN SOCIETY, Summer, 1981

Hortus Second lists, but does not describe woolly thyme (*Thymus lanuginosus*) as a variety of *Thymus serpyllum*. *Hortus Third* lists the plant as *T. pseudoserpyllum* and describes this and other thymes as follows (paraphrased):

THYMUS. Labiatae, 300–400 spp. Aromatic small shrubs or per. herbs. Eur. Asia. Usually prostrate or creeping. Woody at base (at least). Mostly square in cross-section. Lvs. opp. entire. Most thymes grown in American gardens appear to be of confused identity and erroneously named. . . .

T. lanuginosus. Mill. Closely allied to *T. serpyllum*; not known to be cult.; material listed under this name is *T. pseudoserpyllum*.

T. pseudolanuginosus. Mat-forming, creeping per., scarcely 1/2 in. high, sts. woody at base; lvs. broadly elliptic, about 1/8 in. long obtuse, hairy on both sides; fls. few in lf. axils, corolla pale pink, about 3/16 in. long.

Whatever the proper botanical name, *Thymus lanuginosus* of the trade can create a pleasing lawn. While one might, as a design purist, prefer that no blooms ap-

The refined texture and pale matte green color of a woolly thyme lawn contrast handsomely with the ornamental evergreens and shrubs.

pear, appear they do. Seeding does occur and, as with *T. serpyllum* varieties, seedlings show up even in places fairly remote from the planting and must be removed ruthlessly and early from areas where more delicate, choice plants are grown.

In general, woolly thyme is highly satisfying. Its gray-green, densely hairy leaves provide a non-garish carpet, turning to gray-green with purplish overtones in winter. If "properly" grown—i.e., slightly out of character—the mats are quite even and intermingle freely. Minimizing the sub-shrubby character of the genus is esthetically desirable in the lawn.

When established *T. lanuginosus* is reasonably drought resistant. Indeed, it will succumb if continuously inundated for any period. While it flourishes in full sun, foliage may die in prolonged heat (100°F) unless roots are moist. However, most plants recover. Generally plants survive severe winters, although excess salt from snow-ice removal causes death of foliage at street edges. Mats will reform, however, over added gravel as described below.

Dense mats resist weeds, but weed seeds, which can sprout between the thyme plants as the runners advance, will flourish. Well established areas of a hundred by thirty feet require little maintenance. (Weeding is best done with a dental tool—blunt, curved end, lifting the thyme foliage to isolate the weed. Scraping weed roots out of the soil, away from the

hand, while firming soil occupied by the weed works well.) "Deep watering" (the only way to water) when required, is necessary for the health of the existing tap roots and to promote further deep rooting.

How We Started

Initially, I surrounded my plants of woolly thyme with wood chips to smother the grass and weeds that inevitably appeared after removing the conventional grass-and-weeds lawn. Wood chips in this case proved an error. The thyme runners did not form abundantly and the plants became quite shrubby. They frequently died after several years. Chance led to a more satisfactory method of cultivation. An abutting area of coarse sand revealed a predilection of thyme for sand; runners crept onto it and a lush mat soon formed. This prompted me to experiment with sand in another area, already languishing. Sand was forced under the mats. Rooting occurred and growth became more dense. This treatment was then extended to other areas. But, as always, prevention is a better cure. Now I plant thyme directly in coarse sand as I do many plants. Seedlings on my sand pile grow roots four to six inches long by the time they are transplanted.

Our local coarse sand is pinkish-brown and is freely interspersed with small pebbles (perhaps 10 percent by volume). It is called construction sand by our local purveyor. Predictably the sand will settle, as much as 30 percent if used dry. This sand drains well at the surface but at a depth of two inches (especially if over moist soil) will retain some moisture for considerable periods.

Advantages and Limitations

Thyme runs over it freely and often roots down. This plebian medium serves as an excellent bed for weeds as well as for thyme seeds. However, weeding is quite easy and, if accomplished early, thyme seedlings are not threatened or damaged. Parent plants rarely become shrubby on this sand base, a decided advantage for a lawn.

Until three years ago I hesitated to feed my thyme lawn, although I topdressed it with humus and sand. Now I also add a

modicum of bone meal in late March. Results have been gratifying so this treatment will probably be permanent.

Does the thyme lawn survive traffic? If plants are shrubby, considerable damage will be done by feet or garden carts. Bare feet (visually and texturally this woolly thyme is most inviting) are not harmful. Prolonged exposure to trauma can be fatal, however. One section of my lawn was destroyed during construction of the alpine greenhouse. A scaffold-way in such an eventuality is indicated. Scooting along on my pillow, as I sit to weed, is not a problem for the plants, but this is more safely done when the plants are not wet. Heavily trafficked areas require stepping stones or paths, a requirement for any ground cover.

Establishing new mats from rooted cuttings or from layers with roots is quite simple: planting can be done directly into sand as mentioned, even in midsummer, if kept moist. Large clumps, or cuttings grown to

plants in pots, require more care. Large mats can be divided with a spade into sods with a depth of ten to twelve inches and placed in a hole of similar depth containing a "gruel" of water, sand and soil. Such clumps may contain a tap root or so but will certainly have a tangle of fine roots which require the exclusion of air pockets.

Establishing a thyme lawn can be done gradually. For the impatient it must still be dependent on a commitment to propagate. It is moot whether areas are covered more quickly by planting cuttings with roots directly into the lawn area or into pots for later replanting. Since "maintenance free" is a relative matter, one needs only to decide whether one wishes to work awhile and wait—or cut grass.

A casual warning: if you wish to be left undisturbed by inquiries and/or compliments from passers-by and all service people, do *not* create a *Thymus lanuginosus* lawn. ❧

Is Grass Dangerous to Trees?

Reprinted from CROPS AND SOILS MAGAZINE, June-July, 1981

It is not uncommon to see the growth of a woody ornamental inhibited when there is turfgrass growing close to the trunk or stem of the plant. Many persons believed that the suppression of growth was due only to competition for moisture or nitrogen, with the grass taking up the nutrients before they percolated down to the roots of the tree or shrub.

But two researchers in Rhode Island wanted to see for certain what was causing the suppression of growth. What they found was that the suppression was, in part, due to chemicals exuded from the grass roots—the process of allelopathy.

To conduct their research, S.L. Fales, a research associate, and R.C. Wakefield, a professor of plant and soil science at the University of Rhode Island, grew flowering dogwood and forsythia plants in areas that either had turf cover or had part or all of the turf removed.

They found, not surprisingly, that the growth of the ornamentals was better where there was no turf. Then they tried to find out why. They applied additional water—no differences. They applied additional fertilizer—still didn't help the suppressed plants.

Then they leached some materials from the roots of various species of grass and applied these chemicals to forsythia plants in greenhouse sand culture. Shortly after the liquid was applied the growth of the ornamentals slowed.

This experiment showed that leachates from perennial ryegrass, red fescue, and Kentucky bluegrass all suppressed the growth of the two ornamental plant species, allelopathy had again been demonstrated. ❧



Cytisus scoparius

Seashore, sand, gravel or strip mine . . .

POOR, PARCHED SOIL? TRY SHRUBBY LEGUMES

Pamela Harper

Dig up a plant of the common garden pea and on the roots you will find little nodules caused by nitrogen-fixing bacteria. Many ornamental shrubs belonging to the Leguminosae or Pea Family share this characteristic, which enables them to grow in soils low in nutrients, especially nitrogen. Most of them need sun and have deep-delving roots, so they will not flourish near such surface-rooting shade trees as beech and maple, but they are a good choice for dry banks and sunny areas of impoverished soil. Shrubby peas have a special importance in gardens near the shore.

Among the showiest pea-flowered shrubs are the brooms—*Cytisus*, *Genista* and *Spartium*. None are native to America but some have become naturalized,

particularly the Scotch broom (*Cytisus scoparius*). In height brooms range from such tree-size shrubs as *Genista aetnensis* to the prostrate *Cytisus decumbens*. The former is seldom seen in American gardens though it can be grown as far north as New York City, and the latter sometimes graces rock gardens in the mid-Atlantic states.

A few brooms are spiny (*Genista hispanica* makes dense, prickly hummocks), but most are not. There are brooms with flowers of white, cream, pink, lavender, purple, red and bicolored, but the majority are bright yellow. By far the best known in the United States, and among the hardiest, is the Warminster broom (*Cytisus x praecox*) (Zone 5), good-looking all year and a captivating creamy-yellow waterfall



Genista hispanica is unusual because it is spiny, making dense hummocks with lemon yellow blooms.

in spring. Good-looking, that is, if not allowed to get cluttered with dead basal twigs. Prevent this by trimming back stems with spent flowers after bloom each year, at the same time removing at ground level one or two of the oldest branches. Leggy old specimens cannot be rejuvenated; replace them with new plants, which will grow rapidly. 'Allgold' is a bright yellow-flowered cultivar.

Pruning is even more important with the rush-stemmed Spanish broom (*Spartium junceum*). Left to its own devices it grows tall, but chances are it will topple under its own weight. "A wonderful shrub when kept low and bushy by the sea wind's blast," says *Hilliers' Manual*. Pruning shears can substitute for wind. Cut back this plant sharply each year to keep it below shoulder height.

Most brooms are yellow, but the hedgehog broom (*Erinacea anthyllis*) is purplish blue. A tiny porcupine of a plant, with hardly any leaves but spinelike "evergreen" glaucous branches, this is a gem for the driest part of the rock garden. Ex-

pect a five-year-old to be six inches high and wide, an elderly plant not much more than a foot. In coastal Virginia (Zone 8) it has survived a winter of prolonged freezing weather with the mercury down to 5°F.

To all intents and purposes brooms are evergreen, but in most of them the greenness comes from the stems, the leaves being so tiny that they are not missed when they fall, nor noticed on the ground. Many other legumes have pinnate or trifoliate leaves, usually deciduous, including *Indigofera*, *Lespedeza*, *Robinia*, *Caragana* and *Colutea*. The trifoliate leaves of Moroccan broom (*Cytisus battandieri*) have a silvery sheen. This charming tall shrub is scarcely worthwhile where it suffers severe winter damage, as in New York City, but in Zone 8 it is usually evergreen. The flowers are a lemony yellow and come in large conical clusters.

Other Legumes

The very word Siberia chills the blood, so the ruggedness of Siberian pea-shrub (*Caragana arborescens*) can be guessed at.

Few soils are too poor for this tall grower, few winters too cold, summers too dry or winds too strong. This is not a top-rank ornamental, but it does have a good show of yellow blossoms in spring. The very slender leaflets of 'Lorbergii' give feathery delicacy to that cultivar.

Bladder-senna (*Colutea arborescens*) is a good choice for impatient or transient gardeners. It grows fast and tall but can be hard pruned in winter. The pinnate leaves have grace, and though the yellow pea flowers of May are small, the large reddish canoe-shaped inflated pods of summer are eye-catching. They burst with a satisfying pop when squeezed. We need shrubs of this kind which can fend for themselves. Bladder-senna is not often found at the garden center, but it grows easily from seed. It may even necessitate some weeding once it is in the garden.

This is also the case with *Indigofera kirilowii*. P.M. Van Melle (*Shrubs and Trees for the Small Place*) describes it as "an ingratiating little Chino-Korean shrub of suckering, spreading habit, forming considerable patches some 2½ feet high with pretty little clusters of pink flowers at the end of the season's growth in June and July." It may die back in winter, and in any event is bare of leaves until well into spring, which makes the long, wiry branches an excellent disguise over the dying foliage of such small, early bulbs as *Narcissus* 'W.P. Milner'.

Indigofera decora (*incarnata*) is the gem of the genus. It is stoloniferous and spreads into sizeable patches, sometimes dense enough to be considered ground cover, but on light soil rather sparse and patchy. It is seldom much more than a foot in height. Enchanting wisterialike racemes of rosy pink flowers (white in *I. d. alba*) come in May in the Southeast, July in Boston.

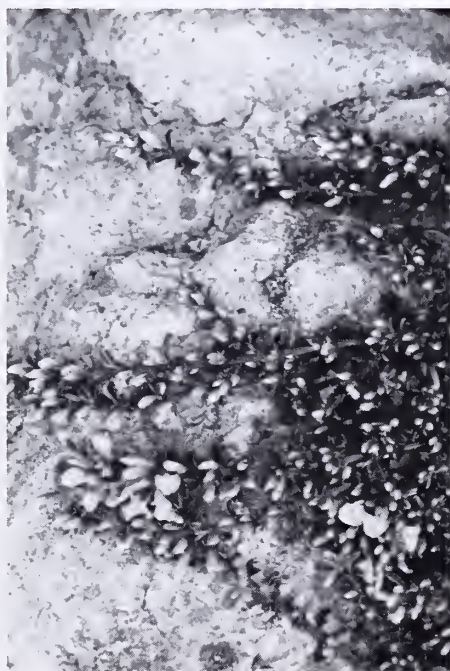
Bush-clover, Robinia, Amorpha

Bush-clovers (*Lespedeza*) are quite similar

in flower to *Indigofera kirilowii*. Their special value lies in the lateness of their blooming season. *L. thunbergii* is the best available, flowering on arched branches in late summer. Hard-to-find white-flowered *L. t. 'Alba'* is regarded by some botanists as a separate species, *L. japonica*.

Some stoloniferous robinias are excellent for colonizing sunny banks of impoverished soil. *R. fertilis* and the similar *R. hispida*, sometimes called rose-acacia, bear short racemes of bright rosy pink flowers on very bristly, rather brittle stems, which may be head high but are usually less. Seed pods are covered with glistening red bristles.

Thomas Jefferson knew false-indigo (*Amorpha fruticosa*), a native eastern species. Look for it if you visit Monticello, his home in Virginia. Out of flower it might be confused with *Wisteria* (also a legume), but the floral clusters are short pokers of tight-packed dark purple blossoms which attract bees. Pass this one up as too gawky for most gardens and seek out instead the 4-foot-or-less leadplant (*A. canescens*) from the Midwest, a thicket-forming shrub with finely cut gray leaves and violet-blue flower spikes. ❧



With a little encouragement, *Genista pilosa procumbens* will spread across and soften a stone outcropping.

AN EASY VEGETABLE GARDEN

Ogden Tanner

Reprinted from CONNECTICUT TRAVELS, February, 1981

Richard and Corinne Willard of Wethersfield, Connecticut, have been raising their own vegetables since they were knee-high to a pole bean, and they have more fun doing it every year. The Willards are not only enthusiastic amateur gardeners; they happen to be professionals as well. They met when both were at the University of Connecticut at Storrs, she preparing for an eventual doctorate in horticulture and he specializing in vegetables and soils.

Today Dick Willard is president of Comstock, Ferre & Company, a family firm that recently celebrated its 160th anniversary, making it the oldest seed company in continuous operation in the United States. The company still holds forth on the same site in Wethersfield's lovely historic district, and it still sells seeds and supplies to local farmers. It also caters to visitors who come from all over to its colorful and well-stocked retail store, as well as to hundreds of hardware and garden outlets that carry its seed packets. Some 25,000 customers around the country send in for its catalog.

Recently we asked the Willards, in the light of their own experience and tastes, if they would design a 20 by 30 foot vegetable garden that could be planted and enjoyed by anyone favored with average Connecticut climate and soil which is warmed by the sun for at least half of each day. Here is the result. Suggested plantings start with the north end of the garden (20 feet across) and move to the south in consecutive bands or beds. Size, arrangement and selections can be modified to suit your own tastes.

North border: 6 pole beans on supports (recommended varieties, King of the Garden lima and Kentucky Wonder or Romana), plus 1 plant of the novel Yard Long asparagus bean at the end of the row.

Bed no. 1 (4 by 20 feet): Four rows of bush peas (Sparkle, Dwarf Gray Sugar). Fold newspapers the long way and place

between rows, weighted down with handfuls of soil, to eliminate weeds. About the third week in June, pull the spent plants (which will have enriched the soil with nitrogen) and replant the bed with two rows of broccoli (Green Comet, Premium Crop), Brussels sprouts (Long Island Improved, Jadedcross), cabbage (Stonehead or Ruby Ball for early harvest, Penn State for late) and/or cauliflower (Snowball, Snow King).

Bed no. 2 (3 by 20 feet): Left half—2 hills of zucchini squash (Ambassador, Gold Rush). Right half—1 hill of slicing cucumber (Marketmore) on climbing supports; a few plants of sweet fennel (Fennochio); 1 hill of cantaloupe, also known as muskmelon (Saticoy Hybrid) or honeydew melon (Baby Slip); a few plants of turnip broccoli (Early Pugliese, Late Rapone).

Bed no. 3 (3 by 20 feet): Left half—another 2 hills of zucchini. Right half—several plants of Chinese or celery cabbage (Michihili); 1 hill of summer squash (Early Prolific Straightneck); 1 Japanese climbing cucumber and a row of edible-pod peas (Sugar Snap), both on climbing supports such as plastic netting on poles. Round out the front of this section with a short row of parsley (Moss Curled, Plain Leaf Italian).

Bed no. 4 (3 by 20 feet): In back—leeks (American Broad Flag) and slicing onions (Sweet Spanish Yellow). In front—onion sets (red, white or yellow).

Bed no. 5 (4 by 20 feet, raised with an extra 6 or more inches of soil fluffed up with organic matter like compost, or peat-moss and a balanced fertilizer): Left section—beets (half Detroit Dark Red and half Cylindra). Center section—carrots (Tendersweet, Spartan Bonus). Right section—witloof (French endive) or escarole (Bataavian Full Hearted).

Bed no. 6 (3 by 20 feet): 6 staked tomato plants (Better Boy for continuous fruit,

<div>Pole Beans</div> <div>4 rows of bush peas, followed by 2 rows of broccoli, Brussels sprouts, cabbage, cauliflower</div>										<div>(North)</div> <div>↑</div>	
Zucchini (2 hills)		<div>Turnip broccoli</div> <div>Cucumber with support</div> <div>Sweet fennel</div>						Melon run			
Zucchini (2 hills)		<div>Chinese cabbage</div> <div>Sugar Snap peas with support</div> <div>Japanese Cucumber</div>						<div>Summer Squash</div> <div>Parsley</div>			
Leek					Sweet Spanish onions						
Onion sets											
Beets		<div>Carrots</div> <div>(all in raised bed, 2 parallel rows)</div>						<div>Witloof or Escarole</div>			
X		X		X		X		X		<div>Tomatoes, staked or tower</div> <div>Cress</div> <div>Dill</div>	
<div>Bush beans</div> <div>Lettuce, sequential</div> <div>Lettuce</div>					<div>Swiss chard</div> <div>Bush beans</div>						
Eggplants					Peppers						
Radishes, lettuce, followed by flowers											

Above is a schematic of the Willards' design for an ideal garden, measuring 20 by 30 feet, that can be planted and enjoyed by almost anyone in Connecticut.

RADISH



© 1968

Antique Comstock seed packets.

TOMATO



©

Floramerica for mid-season harvest). For smaller cocktail or salad tomatoes, try a plant or two of Sweet 100 tied to 6 foot stakes, or Patio, grown without stakes in the garden or in containers on the terrace. At the far end of the row, or elsewhere in the garden, save space for some herbs to use in salads, soups and other dishes. Some favorites: cress, sweet marjoram, roquette, sweet basil (Green Bush, Dark Opal) and dill (Bouquet).

Bed no. 7 (5 by 20 feet); In back—bush beans (Tendergreen, Blue Lake or Cherokee Wax, Royal Burgundy) and Swiss chard (Giant Lucullus, Rhubarb Chard). In front—sequential plantings of butterhead lettuce (Buttercrunch, Crisp As Ice) and romaine (Parris Island Cos). Fill out the row with more bush beans if you like.

Bed no. 8 (2 by 20 feet); 4 eggplants (Midnight) and 6 peppers (Bell Boy, sweet; Jalapeno, hot; Cubanelle, frying).

Bed no. 9 (3 by 20 feet): First planting—radishes (Champion, Cherry Belle), more lettuce plants. Next planting—sweet basil, marigolds, blue ageratum or petunias. To set off the corners of the garden, try geraniums or nasturtiums in tubs.

All the plants noted above, and well over 800 others, are described in the company's catalog, along with directions on timing and planting techniques, including when to start certain seeds indoors. For a free copy, write: **Comstock, Ferre & Co.**, Box 125, Wethersfield, Conn. 06109.

Other Sources

Other companies also offer a wide selection of vegetable, herb and flower seeds, including their own special varieties. Their catalogs make good winter browsing, with mouth-watering pictures, useful growing hints and often humorous anecdotes or practical, down-home ad-

vice. Some of the more outstanding ones are listed below. The catalogs are sent free of charge; all you have to do is drop them a line.

W. Atlee Burpee Co., 300 Park Avenue, Warminster, Penn. 18974. One of the largest and best known houses, Burpee conducts extensive trial plantings every year at its Fordhook Farms in Pennsylvania and Floradale Farms in California, testing the performance of hundreds of vegetables and flowers; in addition to 50 or so exclusive varieties the company has developed itself, it lists superior strains from other breeders.

Joseph Harris Co., Moreton Farm, Rochester, N.Y. 14624. A highly respected supplier, Harris has some of the finest vegetable and flower trial gardens in the country on its farm east of Rochester. Its first-rate catalog, with clear illustrations and descriptions, offers many exclusive varieties.

Herbst Seedsmen, Inc., 1099 N. Main St., Brewster, N.Y. 10509. Just over the line west of Danbury, Herbst offers some 2,500 items, including 15 varieties of Chinese cabbage and 42 herbs. Its catalog contains handy charts for selecting vegetables best suited to individual gardens.

Gurney Seed & Nursery Co., Yankton, S.D. 57079. Gurney's large, colorful, friendly catalog is probably the most widely read gardening publication in the world, with close to 15 million copies distributed every year. It offers a complete line of vegetable and flower seeds, helpful planting tables and cultural instructions—and pictures of smiling Gurney customers with the robust fruits of their labors.

Johnny's Selected Seeds. Box H, Albion, Maine 04910. This small Downeast firm specializes in vegetable and herb seeds proven hardy in northern gardens. Its catalog, while smaller than some others, has been praised by knowledgeable gardeners as among the most useful of any, a miniature encyclopedia in itself.

Nichols Garden Nursery, 1198 Pacific Highway, Albany, Ore. 97321. Nichols stocks a complete selection of vegetable seeds, featuring European and Oriental varieties, as well as herb seeds, herb plants, saffron crocus and other hard-to-

find items. If you can't get it elsewhere, this is the place to try.

Geo. W. Park Seed Co., Greenwood, S.C. 29647. Park purveys one of the nation's largest assortments of flower seeds and an extensive selection of vegetable seeds, more than 3,000 varieties in all. A special feature of its catalog is a handy tabulation of seed varieties, including seed sizes, light and moisture requirements, germination times, times of maturity, etc. Like some others in the trade, the Park people give you the feeling that they *want* you to enjoy their products ("Your success and pleasure," reads their credo, "mean more to Park than your money.")

Stokes Seeds, Inc., Box 548, Buffalo, N.Y. 14240. A family-owned enterprise celebrating its 100th anniversary this year, Stokes is one of the fastest-growing seed houses in the U.S. Undoubtedly one reason is that the folks at Stokes seem to know their business, as evidenced by the detailed growing instructions given for each category of plants.

Thompson & Morgan, Box 100, Farmingdale, N.J. 07727. "The world's largest and most famous seed catalog" boasts nearly 4,000 varieties, beautifully photographed in color, including such specialties as the Cabbage-Sprout, the Sub-Arctic early-maturing tomato, vitamin-rich carrots, leafless peas, cut-and-come-again lettuces and Italian broccoli—plus a unique series of Eating Guides evaluating vegetable varieties according to flavor and nutritional values.

Vermont Bean Seed Co., Garden Lane, Bomoseen, Vt. 05732. For lovers of tasty beans and peas, this unusual and charming catalog offers "the largest bean and pea seed selection available anywhere in the world"—more than 100 bean and 30 pea varieties. Among them: the crisp, sweet Sugar Snap edible-pod pea, which won the All America Selections Gold Medal in 1979 (and is widely sold by other seed companies), as well as other sugar or "snow" peas, yellow and green snap beans, pole beans, lima beans, shelling and drying beans, garden peas, cow peas, soybeans and seeds for edible sprouts. If you need any advice on selections or growing techniques, just call the company's expert, Wilbur Cornwall, at 802-265-4212. ❧

All the Dirt About Living with a Gardener

Eden Lipson

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It's all glorious when company comes. You live in an apartment-bower, they say, a duplex-paradise, an indoor flower garden in the middle of the city. They rave, they coo. They are suitably jealous. Is that a miniature rose? Cineraria? A streptocarpus? A lily? A Rieger begonia? Pansies? Narcissus and daffodils? All in bloom? Who does the watering? Where do the plants come from? How do you do it?

Ha! Little do they know. For day-to-day living, in Manhattan-scale space, life with a serious gardener is complicated and sometimes hazardous. A cook, even an obsessive one, keeps his equipment in the kitchen. Stereo systems grow, but they don't shed or need to be fed. Model railroads and sewing machines fold up into boxes. But gardening space and storage areas can seldom be confined to a single room, and plants are living things requiring constant attention.

Be warned. It starts quietly. You are living with the basic house plants and a few gardening books, mostly paperback. Then new plants and catalogues start to arrive and you notice your constant companion coming home with 40-pound sacks of potting soil at the bottom of the grocery cart. The territorial struggle has begun.

At first it is beguiling. All those pretty new plants and flowers. But your companion has become a pod person and silently re-evaluates your whole domestic space in his new gardening terms. All the windowsills are surrendered. The light, the natural light, he murmurs. You think a happy balance has been established, but it was only the first round. There's a grand plan.

Next the obvious shelves are infiltrated. Grow-lights with timers are installed and little pots suddenly displace old treasures. Soon even the less obvious places are seized—the far corners, the ledges. Guests lingering over coffee hear unnerving clicks from other rooms as the lights go out. "Good night ferns." "Good night violets."

Then the equipment is everywhere. Peat pots and small clay saucers nestle on the bookshelves, which are crammed with botanical reference texts. African violet food and fish meal emulsion are right next to the aspirin in the medicine chest.

The plant mister comes in handy for sprinkling the ironing, but that doesn't make up for the missing knives and forks used for planting. There are open sacks of soil, vermiculite, perlite and marble chips at the bottom of the closets. Clay pots turn up in the dishwasher right next to the good crystal. The crystal is now gritty, but the pots are sterilized.

Last spring he cornered the market in clear plastic sweater boxes, filled them with planting mixtures and used them to start seedlings for the window boxes. At one point he boarded out six boxes in the downstairs neighbor's front window where the light was perfect. Later they were hardened-off on the roof, and then put into window boxes. That didn't mean I got to put sweaters in any of the boxes when summer came; he planted out the petunias, impatiens and coleus but filled the boxes with germinating peat pots, now hiding in the requisite darkness under our bed.

And what about the watering? Ah yes, the daily rounds. No more long weekends in the country. Overnights are all that is possible. Hysteria at the prospect of a week's vacation with hired waterers.

The floors, thank heavens, are polyurethaned, but that only means the spills sit on a slippery surface rather than staining the wood. We have a cute, expensive wind-up hose, but he thinks it is impersonal and hard to rewind. Besides, he prefers the quiet contemplative back-and-forthing with the little green can that drips.

I complain and I fuss. I mop up water, wash out the bathtub, shoo the cats from the ferns and pick off dead leaves. But my real commitment to this glorious and slightly crazed way of living only recently emerged: I volunteered for the white fly/mealybug/pest patrol. ❀

'GREENHOUSES' GUARD TOMATOES AGAINST EARLY FROST

Peter Tonge

Reprinted by permission from THE CHRISTIAN SCIENCE MONITOR, September 18, 1981.

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The tomatoes—red ripe, and delicious—have been coming in fast ever since late July (I've been eating three a day on average) until a week ago.

Suddenly, the abundant flow has become a trickle. But there is promise of many more to come (a miniglut almost) if I can protect those green and tender tomatoes from the first frosts of fall.

The very weather—warm days and chilly nights—that puts such fiery hues into the leaves of the alders, maples, and other hardwoods takes the color right out of tomatoes. Not only does frost threaten the plant itself, but cool weather delays the ripening process as well, and this accounts for the sudden slowdown of my harvest.

Fortunately, there is something that can be done both to speed the ripening and to protect the plants from frost. Actually, it's pretty straightforward and you might like to try it:

Take some welded fencing (chicken wire will also do but you will need more supporting posts) and place it in a circle around your tomato plant. Don't make it a complete circle. Leave a 6-inch gap down one side so that you can reach in to pick the fruit. Make the fence circle about as high as the tomato vine.

Now wrap clear plastic sheeting around the fence and attach it to the fence with clothespins or similar devices. Have the two ends of the plastic overlap by about a foot. Make sure that the ends coincide with the gap in the fence so you need only unwrap a few inches of the plastic when you come to pick the tomatoes.

What you have now done is wrap a clear thermal blanket around your tomato vine. It will love you for it. The sun, shining through the plastic, will warm the vine even when the chill fall winds blow. At the same time there will be adequate air exchange through the open top.

That open top, however, must be covered over in the evening with pieces of wood, old sheets, or blankets—whatever is available—to slow down the loss of heat from around the plant. Even covering the plastic with additional material will help.

Meanwhile, the increasing popularity of passive solar housing has shown us the value of heat-storage materials, often referred to as thermal mass. They absorb the excess heat during the day and then radiate it out around the plant at night.

A simple way to store heat around your tomato plant is to surround the base of the plant with a mulch of rocks, stones, or bricks.

Plastic jars filled with water will also do an efficient job of storing heat. Cut away some of the lower leaves from the tomato vine so that the sun can directly strike the surface of the stone or the water bottles.

When more than a mild frost threatens your area, you can improve the situation still further by filling a plastic milk bottle or similar container with hot water from the kitchen faucet and placing it at the base of the plant. This will have the same pleasing effect on your favorite tomato vine as the old-fashioned hot-water bottle had when taken to bed on a cold night.

Of course, there are many variations on this theme. Any frame with a covering of plastic will form an acceptable greenhouse for this time of year. Perhaps the simplest method of all is to stretch a line between two poles and then throw a sheet of plastic over the line, anchoring it a few feet out either way with bricks or soil. This way you will have formed a plastic tent that will help your plants through the early light frosts of fall.

Naturally, tomatoes aren't the only tender garden crops you might want to protect. Among them are zucchini squash, peppers, and eggplant; they'll all go on

Trapping and storing heat are the principles of this late-season "greenhouse."

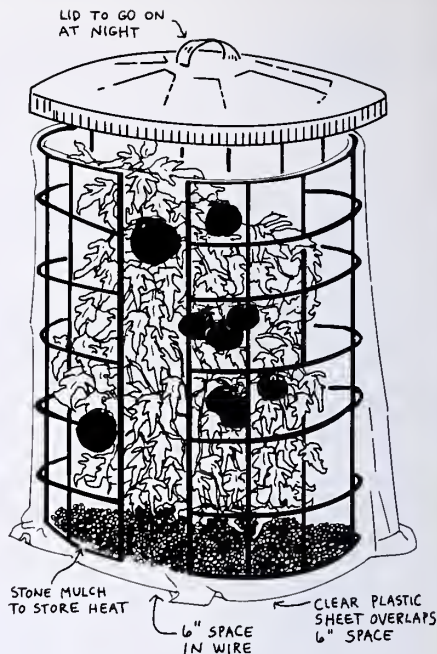
Drawing by Kay Kling, adapted from Frank Whitelock

producing for you if you can just make the nights a little bit more comfortable.

I recall one fall several years ago when an early frost put an end to the tomato crop. At the time I figured we had twice as many green tomatoes on hand as we had picked ripe ones during the summer. The frustrating and tantalizing part of the whole experience was the weather during the following four weeks. We enjoyed the most perfect of Indian summers—warm, windless days without even a touch of frost.

Had I protected those vines on just that one occasion, I believe we would have doubled our tomato harvest that year.

We'd have had a lot more zucchinis, too. ❀



Member's Seed Dividend

Seeds of three attractive herbaceous perennials are offered to Members of the Brooklyn Botanic Garden this spring. The first is *Helenium autumnale*, a 4-foot-tall, late summer blooming native daisy with yellow flowers. It is a "bridge" plant, flowering after most delphiniums and phlox but before the main tide of chrysanthemums. Plants need sun and benefit from more-than-usual moisture. Seeds are a gift of BBG Members Henry Bielecke and Allen Hawkridge.

Cardinal flower (*Lobelia cardinalis*) is also available. The striking deep red blossoms appear on 2-to-4-foot stalks in mid- to late summer. Plants grow well in sun but also thrive in shade. Extra watering helps, but cardinal flower is a short-lived perennial, so save a few seeds of this native for restarting every year.

Symphyandra hoffmannii, a rare perennial from Yugoslavia, is also offered. A relative of the bellflowers (*Campanula*), it bears handsome white bells on 2-foot-tall stalks in midsummer. Give this plant sun or part shade, and remove spent blossoms unless extra seedlings are wanted the next year. Cardinal flower and *Symphyandra* are from the Editor's own garden.

If you wish seeds, please send a stamped, self-addressed envelope (marked "hand cancel") to the Editor, Brooklyn Botanic Garden, 1000 Washington Ave., Brooklyn, NY 11225. ❀

KANNONCHIKU AND SHUROCHIKU

J. Leland Hollenberg and Koichi Inoue

Reprinted from PACIFIC HORTICULTURE, Winter, 1980-81

For almost four hundred years Japanese gardeners have cultivated and admired dwarf potted palms known as *Kannonchiku* and *Shurochiku*. The former is *Rhapis excelsa* and the latter *Rhapis humilis*. In the United States these plants are often given the common names lady palm and slender lady palm. Both palms are native to the southern part of China and adjacent areas of Asia, where they are found growing in the shade of trees in humid valleys. *Rhapis excelsa* is found in great numbers in wild vegetation around Mt. Kannon in Okinawa. (Kannon is the Goddess of Mercy in Buddhism). *Chiku* means bamboo, and refers to the appearance of these palms. *Shurochiku* comes from *Shuro*, the Japanese name for the common palm *Trachycarpus fortunei*.

According to tradition these plants were first brought to Japan in 1609 by Lord Shimazu, the feudal ruler of Satsuma Province. Both have been domesticated and cultivated for such a long time that many people now think of them as indigenous to Japan.

The Japanese botanical genius Kaibara Ekken, who wrote 270 books on various subjects between 1707 and 1715, refers to these palms in his remarkable work *Yamato Honzo*. He states that they were once called *Hobichiku*, which means phoenix-tail bamboo, because the leaves resemble the tail feathers of the mythical phoenix.

Rhapis excelsa reaches a height of about two meters (6 feet) when mature. By contrast *R. humilis* is almost five meters high (14 feet). Under the restrictive conditions of container culture they seldom exceed half these heights, and their size makes them suitable for growing indoors. In Japan these plants are almost never grown to maturity, but instead are prized as potted plants in the juvenile stage, when only

six to perhaps fifteen fronds are present. Then they are about ten to thirty centimeters (4 to 12 inches) high, not including the pot.

Rhapis palms produce many trunks. It is this ability to generate additional shoots that enables owners to maintain handsome juvenile specimens. Fine specimens can be very graceful and *Rhapis* are often characterized in the United States as the Rolls Royce of palms. Mature specimens of both species are growing outdoors at the Huntington Botanical Gardens in San Marino, California, and are found in most large tropical plant collections.

When a seedling of one of these palms first sprouts, the monocotyledon looks like a single blade of grass about five centimeters (2 inches) long and perhaps six millimeters ($\frac{1}{4}$ inch) wide. The second, third and fourth leaves usually look about the same. The fifth or sixth leaf is likely to divide into two or three segments. Mature fronds of *Rhapis excelsa* usually have from six to ten segments or leaflets and in the case of *R. humilis* there are twelve to twenty. However, under the special cultural conditions devised by Japanese gardeners, the juvenile forms of these palms, particularly of *Rhapis excelsa*, tend to exhibit very broad, cupped, single leaves on fronds.

Cultivation

The Japanese favor growing these palms in ceramic pots of special design. The pots resemble bowler hats turned upside down, each with a flat rim and three legs. For ordinary use plain dark colors are most common. However, for exhibiting a very choice plant, the grower may use a carefully selected decorated pot the beauty of which enhances the overall appearance. Most pots are quite small, seldom exceeding fifteen centimeters (6 inches) across the



南山錦
静岡 山下五郎

A *Rhapis* cultivar, 'Nanzannishiki', carefully grown in an ornamental, footed pot commensurate with the esteem in which it is held.

rim. Because drainage is so important for good culture, the pots have a large drain hole. To keep the potting medium in place, the drain hole is covered with a special piece of ceramic known as a *sana*, which usually has seven smaller holes in it.

In Japan small potted specimens are grown in gravel taken from a stream bed and screened into three grades. The largest pebbles are about the size of beans and fill the bottom twenty percent of the pot. The middle grade pebbles are about the size of small peas and occupy the next thirty percent. The smallest pebbles, about the size of rice grains, provide the rest of the potting material. Some growers add a handful of coarse compost along with the finest pebbles. The surface of the gravel is kept covered with a generous layer of sphagnum moss to retard evaporation. They can also be grown in commercial potting mix.

Cultivars

The discovery of striped or variegated *rhapis* was recorded about 1700. There are now many plants with variegated leaves and these are most highly prized by the Japanese. However, plants with variegated leaves are more demanding in their

culture and did not become popular until after 1925. This variegation is thought by some to be induced by a virus. Others believe it is caused by mutation, which seems most likely to occur in a new shoot when the palm very nearly dies and is nursed back to health. Some variegated plants regularly produce offspring with the same pattern of variegation, and these are much more valuable than those from which the offspring vary.

During nearly four centuries of propagating these small palms, Japanese growers have selected and named several hundred green *rhapis* cultivars and almost as many variegated ones. The most popular and valuable named cultivars are arranged in a Ranking Table. The highest in the table is 'Eizannishiki', which means Brocade of Prosperous Mountains. A single division of this beautiful plant recently sold for two million yen (about \$8,000).

The popularity of *Kannonchiku* and *Shurochiku* in Japan reached peaks in approximately the years 1940, 1950, and 1967, and it is rising strongly at present. One reason for the enduring appeal of these palms is that they may be kept indoors where the owner may admire the graceful form of the plant and can easily tend to its needs. By contrast, the far more widely known bonsai must be kept outdoors nearly all of the time for good health.

Although these palms are tropical in origin, they adapt quite well to homes and apartments, even unheated ones. Plants of *Rhapis excelsa* are hardy to about -3°C (27°F) for several hours, and those of *R. humilis* can withstand temperatures as low as -8°C (18°F) for many hours, provided the plants have been acclimated to cold weather. The humidity requirements of both kinds of palms are easily met in a greenhouse or in most homes. They are quite adaptable; specimens of *R. excelsa* have thrived indoors for several years with no extra humidity except a weekly sprinkling and watering given outdoors in the shade.

Although these palms are expensive in the United States, they make ideal houseplants. Unlike most house plants, they can be looked on as a permanent investment, for they are quite slow growing. Under average conditions only about six

new fronds grow each year, each one shifted sixty degrees around the trunk from the previous one. Even under ideal conditions the increase in height is seldom more than eight centimeters (3 inches) each year. If a cane eventually becomes too long, it can be rooted by air layering

just below the lowest live fronds and then removed to provide a new plant.

We hope to see greater interest among gardeners in America in the art of growing, displaying and, especially, appreciating the graceful dwarf palms from Japan known as *Kannonchiku* and *Shurochiku*. ❀

They've cleaned it up . . .

Bone Meal: Is It a Good Fertilizer?

R. Milton Carleton

Reprinted from NEWS AND VIEWS, American Horticultural Society

Question the value of bone meal as a fertilizer and someone is certain to rise and say, "If you're so smart, why is it that our grandfathers (or fathers) have used bone meal for years and have been satisfied with the results?"

This accusation has a very simple answer. Comparing the bone meal of grandfather's day and the commercial product sold today is like comparing a dish of old-fashioned oatmeal with a serving of devitalized, dehydrated corn flakes. They are not identical.

In the potting shed on big estates in England, or perhaps the hen house on humbler properties, there stood a bone grinding mill operated by a huge wheel. It was used to crush bones from the kitchen and was used either as a poultry feed or a garden fertilizer. Into this mill went fresh bone, perhaps from a rare roast with bits of meat still clinging to it. The marrow contained blood and also some phosphorus still in transit in the animal when slaughtered and not deposited as insoluble tricalcium phosphate, the basic building block of skeletal matter. The ground bone contained as much as 6 percent nitrogen.

In addition to kitchen wastes, many other sources of nitrogen were tossed into the mill. A head gardener was not above salvaging dead chickens and stillborn piglets to enrich the ground bone.

Behind every bothy (a dormitory for apprentice gardeners) stood a huge pile of peat, which served as a urinal for the occupants. The ground bone was mixed with this peat or other dry matter such as sawdust to make a more workable product. The mixture contained every element needed for full plant nutrition.

How does this compare with the dry, white bone meal of commerce? Today, bones are a valuable source of packing house byproducts, elements needed by plants but worth far more in other forms. The bones are steamed to extract gelatin and other byproducts. This removes most of the amino acids, a valuable source of nitrogen. Further processing removes all but about one-half of one percent of the nitrogen. What is left is a substance considerably less desirable as fertilizer material.

Recently, I had an occasion to examine a lawn on which the owner had faithfully applied fifty pounds of bone meal every spring for twenty years. It was pale in color and growing poorly. A divot removed from the turf showed a distinct white line, nearly half an inch deep, just below the surface. Among other adverse effects, this layer of bone meal had locked up practically every trace of iron, robbing grass plants of a basic nutrient needed for chlorophyll formation. It is obvious that today's bone meal is not what it used to be. In fact, it may sometimes do more harm than good when added to the soil. ❀

WHAT CAN YOU DO ABOUT SURFACE ROOTS?

T.D. Sydnor

Reprinted from THE DAWES ARBORETUM NEWSLETTER, June, 1981

Tree roots, growing on the surface, create perennial problems for many homeowners. Especially common in older neighborhoods where major shade trees have been established for fifteen years or longer, surface roots make the lawnmower bounce across the uneven lawn, scalping grass, damaging plant roots and often posing a safety hazard during the mowing operation.

There are a number of reasons why tree roots grow on the surface. Surface roots are one of the consequences of having a tree large enough to properly shade your home. Any large growing tree, given sufficient time, will produce surface roots which can interfere with lawn mowing—faster growing trees tend to produce surface roots sooner.

Choosing the wrong tree is a major contributor to the surface root problem. Trees such as maple, poplar and willow should be avoided in areas where surface roots can cause problems.

Natural root growth itself contributes to formation of surface roots. Most tree roots are initiated four to eight inches beneath the surface. As the root continues to grow, however, it eventually will surface. For example, a root initiated four inches underground will be a surface root once it grows to be eight inches in diameter.

Surface roots can be caused by sheet erosion. Under trees which produce very dense shade soil tends to be more subject to erosion since grass and ground cover are difficult to establish. As the soil washes away in summer storms, roots once underground gradually become exposed.

What to Do

So you have the problem of surface roots—is there anything that you can do about it?

You can prune off the offending roots.

This is often the only solution (short of removing the tree) if roots are breaking up concrete driveways or sidewalks. Roots should be cut cleanly with a sharp pruning saw to minimize the size of the wound. However, when roots are pruned, permanent damage to the tree can result.

The majority of the functioning roots of any tree are located in the top foot of soil. Thus, even shallow excavations, such as for sidewalk construction, can be extremely damaging to nearby trees.

A good rule to follow is to make certain that no more than half the functioning roots under the tree's dripline should be removed at any one time. Once roots are cut, the tree should be treated as if it had just been transplanted, with increased fertilizing and watering until the tree adjusts to the pruning stress.

A temporary solution to the problem is to cover the surface roots. Topdressing a yard with one or two inches of a well-drained medium can alleviate the problem for a time.

If topsoil is used, it should be mixed with peat moss or sand to increase porosity and reduce potential damage. Topdressing with more than two inches of material reduces air circulation to the roots and, depending on the depth, tree type, and location, can eventually kill the tree.

A better solution if surface roots are a serious problem is to plant a ground cover rather than grass. The ground cover is taller than grass and hides the surface roots. However, since most ground covers are intolerant of foot traffic, this solution is a limited option.

Good Trees

Choosing the right tree can at least delay the development of surface roots. Where the homeowner can select the plant for the location, a number of tree species make

good choices: oak, ash, ginkgo, honey locust, sweetgum, zelkova, Kentucky coffee tree, linden, and black gum. Also, trees which have a smaller mature size create fewer surface root problems.

Finally, when no other alternative can be found, the offending tree can be re-

moved. This is often better than extensive root removal.

Generally, homeowners can learn to live with surface roots, taking corrective action only when the problem becomes very severe or threatens to damage sidewalks, driveways, or patios. ❧

Can Vines Kill Trees?

Alan D. Cook

Reprinted from THE DAWES ARBORETUM NEWSLETTER, September, 1981

We're often asked whether vines kill trees. The answer is "What vine?"

Vines can and do kill trees by strangulation or girdling. The vigorous twining vines, such as bittersweet, honeysuckle and wisteria, can twist around a tree trunk and cut off translocation of water and nutrients as the tree grows bigger.

Physical breakage is possible, eventually, with fast growing woody vines. In warmer areas than Ohio, wisteria grows rapidly and can inflict mechanical damage to trees.

If a vine is vigorous enough to make a foliage canopy over a tree, it can kill by "smothering," which really is simply excessive shading. Grape vines in natural stands sometimes wipe out large areas of trees in this way.

But many's the tall tree wearing a blazer of Virginia creeper, brightening the autumn season with brilliant red fall foliage color, and the tree none the worse for it. English ivy and climbing forms of *Euonymus fortunei* seldom grow fast enough to cover a tree's leaves, though they may cover trunk and branches with cozy evergreen longjohns.

"The physician can bury his mistakes, but the architect can only advise his client to plant vines."

—Frank Lloyd Wright



George Todman

An ancient but vigorous wisteria will eventually prevent the oak trunk on which it grows from expanding outward. Result: strangulation.

Prize of \$50,000 Offered for an Orchid Hybrid

Joan Lee Faust

Reprinted from THE NEW YORK TIMES, October 29, 1981

The American Orchid Society will award a \$50,000 cash prize to the first individual or team of plant scientists who creates an artificial orchid hybrid.

This new type of orchid, called a somatic hybrid, will bypass the normal sexual process of plant reproduction, which involves the transfer of pollen from a stamen to the pistil of a flower. Instead, the orchid will be produced by fusion of modified cells from each parent plant.

Orchids are the largest known flowering plant family, with more than 30,000 species. They belong to a class of plants called monocotyledons, which includes grains and grasses and are difficult to hybridize by nonsexual processes.

There are hundreds of orchid hybrids available by the standard hybridization process. The first appeared in England in 1856 with the introduction of *Calanthe dominyi*, a hybrid of two Asian orchids. It has a white flower with a rosy tint. Grown primarily for collections, it is not very popular today.

Reproduction of known orchid hybrids has followed laboratory techniques for years. Since 1922, a method has been used to germinate orchid seed on a sterile medium placed in glass laboratory flasks.

In 1966, laboratory production of orchid clones through tissue culture began, making possible duplication of some of the rarest orchid hybrids at low cost.

The American Orchid Society said it hoped this competition would not only result in new orchids but also stimulate the development of new plant-growing methodology.

The award was provided by Eric E. Young, president of the Orchid Society of Britain. Mr. Young has also been a longtime member of the society's research committee.

The challenge is worldwide. Plant scientists have until January 1, 1996, after which time, if the prize has not been awarded and there are no valid claims pending, the society has the right to withdraw the award. Contact: The American Orchid Society, 84 Sherman Street, Cambridge, Mass. 02140. ❀

E.A. Christenson



Orchid seedlings germinated and grown in a sterile nutrient medium in a sealed glass flask. The same sterile technique is used for asexual tissue culture.

GET BETTER BEGONIAS WITH LESS WATERING

Ilo and Glenn Maynard

Reprinted from *THE BEGONIAN*, July, 1981

Although ours is a small greenhouse (9 by 15 feet), we find it easy to crowd in several hundred potted plants, mostly begonias. When one enjoys propagating plants, the collection increases quite easily. But by the same token the daily task of watering grows and becomes increasingly time consuming, tiring, and can approach boredom.

We obtained a 2-foot water wand on an 8-foot plastic tube attached to a plastic gallon container which permitted retiring the heavy watering can, but no time was saved. Other methods, including the "Texas pot," were also unsatisfactory.

Then we read an article by Dr. P.A. Schippers on NFT (Nutrient Flow Technique) and his improvement over the Texas pot. This gave us the idea that hydroponics might be adapted to our needs. A letter was dispatched to Dr. Schippers posing our problem and asking if he felt his NFT system might be a solution for us.

His response was in the affirmative. After studying a pamphlet he had prepared on the system with instructions on its installation, we asked some additional questions of Dr. Schippers. These he kindly answered and even supplied us with a layout for our greenhouse. With his assurances and our desire we decided to go all out for hydroponics.

Preparations

Doing all of the construction work ourselves, we found that we were faced with more physical work than we had anticipated—procuring plywood for the troughs, digging a hole under one end of a bench for the nutrient holding tank, constructing the tank, making the troughs with necessary support to insure a slope of one to two inches for each eight feet of trough length.

Despite initial installation problems, the system began to take shape. Thanks to

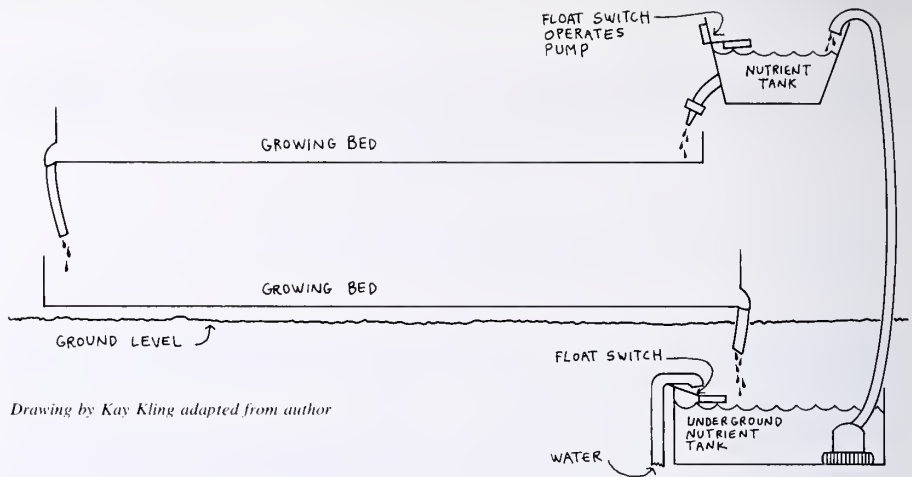
Hydroponic Growing Systems* we were able to procure the necessary supplies and equipment quickly and easily without a lot of shopping around. Rubber stoppers, pre-bored with tubing inserted, screw clips for flow control, float switch complete with rod and float, float valve, pump, fertilizer, a pH and fertilizer test kit were all purchased from this source.

Finally the day arrived when the growing bed troughs were installed on top of the greenhouse benches, lined with 6 mil black plastic sheeting, and filled to a depth of 2 inches with large size perlite. At this point we began adding water to the lower tank, keeping a record of the number of gallons added.

The pump in the lower holding tank fills the upper tank through a piece of half-inch garden hose as often as the level of water falls in the upper tank and activates the float switch. Water is carried from this upper container, an 8-gallon plastic pan supported on a shelf above the troughs, via tubing to a manifold at the upper end of the top bench. This manifold consists of a 1-inch PVC pipe, 8½ feet in length, with rubber stoppers containing six-inch-long tubing inserted at 1 foot intervals along its length.

Each tube has a screw clip to control the flow to a fast drip. The water drains from the upper bench to the lower one and returns to the holding tank. Our pots of plants are now set on top of the damp perlite. Both plastic and clay are in use. Any broken pottery placed over drainage holes was removed and replaced by a piece of plastic screening to ensure better contact between pot and perlite. If necessary, the pot is set down into the perlite to obtain

*Hydroponic Growing Systems, 32 Richardson Road, Ashby, MA 01431.



Drawing by Kay Kling adapted from author

better contact. Also, wicks are sometimes inserted when needed.

Fertilizing

At this point we were able to add another time-saving feature—continuous feeding with a weak nutrient added to the water. Once the volume became constant, which takes some time because the water is being soaked up by the perlite, we could determine the amount of nutrients needed since this is based on the total volume of water in the system.

We decided to use hydroponic fertilizer at quarter-strength. Common fertilizers are not used as they often have a part of the nitrogen in ammonium form; hydroponically grown plants prefer the nitrate form. Also, trace elements are assured. We use Peters Hydrosol (5-11-26) plus one-half the amount of calcium nitrate (15-0-0). At first we used equal parts of each fertilizer until we found leaves were growing to huge sizes; the nitrate is probably okay for cabbages, but not begonias.

We are told that it is sufficient for hobby growers to make two regular tests of the nutrient solution. One is a pH test to determine the degree of alkalinity, adding 2 drops of vinegar per gallon of solution if it becomes too alkaline. The second is a simple phosphorus test to determine the need for additional fertilizer.

There is no need to drain and discard the nutrient solution on a regular basis. Our system has been in operation for longer than one year and we have not yet found it necessary to discard the old solution. Due to evaporation and plant ab-

sorption it is necessary to add fresh water to maintain the solution level in the tank. We do this through the float valve attached to a water pipe.

As you have already deduced, the operation of the system is extremely simple. A trickle of solution is constantly fed to the troughs, keeping the perlite always damp. There is no concern about whether plants are getting enough moisture, avoiding the stress put on plants by soaking them one day and then allowing them to dry out before watering again. It should be mentioned that metal is eliminated from the system; only plastic or rubber materials are used. The nutrient solution in contact with metal is fairly corrosive, and dissolved materials could be toxic to plants.

Potting Mix

We have altered our basic potting mix of equal parts of peat moss, perlite, and vermiculite, which seemed to absorb and retain too much moisture for most begonias. We have reduced the peat moss to one-fourth that used in the basic mix, combining this altered mix with an equal amount of small size fir bark used for orchids.

In addition to watering and feeding our plants, other advantages of the hydroponic system include a higher humidity in the greenhouse, often reaching 80% or more at night. Also, cuttings are rooted easily in pots of perlite and vermiculite, or placed directly in the troughs. So that contact between pot and perlite is ensured, a wick cut from panty hose is inserted in the bottom of the pot.

Lest you decide this is a perfect system,

let us hasten to say there probably is no such thing. We find that we must be a bit more constant in our housekeeping to remove all spent blossoms and leaves from the perlite before they become mush. Algae will grow on the perlite, but it is not harmful. In time, roots grow out of the bottoms of the pots into the perlite and need pruning; especially is this true of plants in plastic pots. An occasional leak

may develop and require attention. Stoppers and tubing will need replacing in time.

We will surely say that our plants have grown larger than when they were watered and fed from the top. Flowering has been more prolific and the blossoming tends to continue over a much longer time.

And most important of all for us, we have been spared that daily chore of watering, watering, watering! ❧

Energy Saving Ideas for Lighting Your Indoor Garden

Woody E. Bickford

Reprinted from *FLOWER AND GARDEN*. December-January, 1981

The high cost of electrical energy threatens the size and number of indoor gardens, if not the existence of them. But some of this threat can be alleviated by practicing electrical energy conservation and making the lights play a dual role.

Here are energy saving hints in lighting your indoor garden, and ideas for putting your lights to work for additional uses.

Use your indoor garden light for more than one purpose. Use it as a night light, room light or safety light. This helps offset the cost attributed to the plants. Also, use the lighted garden as furniture, room divider, part of the home decor, a focal point, as well as a place for growing plants.

Use a timer to prevent long and costly light periods. Make the light period consistent day to day, even on holidays and vacations. The energy used by a timer is well repaid if it prevents only a few instances of excessively long light periods because of forgetfulness. Saving energy saves money!

Use the most efficient light source when possible, and the best color for plants. Use fluorescent when it is the sole light source, and incandescent when it is to supplement room light. Reflector lamps can be used to light a small plant area from a ceiling or wall fixture. It is difficult to light a small plant area from the ceiling or wall with a fluorescent lamp.

Provide only the amount of light needed for your plant species. Find out how much light (footcandles) your plants require and use that amount. The brightest spot under either a fluorescent or incandescent fixture is directly under the fixture. As the distance increases from the center, the amount of light diminishes. Because of this, place plants with the highest light requirement in the central location. The closer the light source, the higher the intensity.

In a cool room, drape clear plastic over the fluorescent indoor light garden. This raises the temperature to a more favorable level for plants. Check with a thermometer to avoid excessive temperatures.

Keep fluorescent or incandescent bulbs and reflective surfaces clean. Clean dust off plants so leaves can make better use of the light. Replace lamps after useful life to keep desired light levels. All lamps depreciate in light output with burning time. A 40-watt fluorescent lamp is still using 40 watts even when its light output is only 60 to 70 per cent of the output when new.

Use aluminum foil or other reflective material such as marble chips or perlite around pots to reflect light back up to the leaves. Use light colored or highly reflective surface behind the light garden for reflection of light back on the plants. Mirrors or mirrored tiles not only reflect light but add depth to the appearance of a light garden. ❧

RECENT BOOKS WORTH NOTING

IN THE LIBRARY OF THE BROOKLYN BOTANIC GARDEN
(Please order directly from your bookstore, not from the Botanic Garden.)

Arts and Crafts

Craft of the Dyer: Colour from Plants and Lichens of the Northeast by Karen Lergh Casselman. University of Toronto Press, Toronto. \$27.50

Mordants, dyeing procedures and classroom techniques are included, with most of the text given to individual plants and how to use them. Thorough.

The Dried Flower Book by Annette Meirhof and Marijke den Boer-Vlamings. E.P. Dutton, New York. Soft cover \$13.50

A Dutch import with attractive drawings of flowers and arrangements. The basic plants (mostly garden plants) are described, as well as techniques for drying.

Essays

The Essential Earthman by Henry Mitchell. Indiana University Press, Bloomington. \$12.95

Gathering of columns by a garden writer for the *Washington Post*. Once over lightly, fast and breezy.

Green Thoughts: A Writer in the Garden by Eleanor Perenyi. Random House, New York. \$15.50

A series of brief, well-composed articles on diverse gardening topics, arranged alphabetically and proceeding from *Annuals* to *Woman's Place* (it is nice to have the A to Z treatment stop before *Zinnia* for a change). Some parts, especially on pesticides, are shoot-from-the-hip organic, but the whole is generally entertaining and fast-moving.

Earthly Pleasures by Roger Swain. Scribner's, New York. \$10.95

Series of well-constructed, absorbing essays on the scientific side of natural history and gardening, written by the science editor of *Horticulture Magazine*. Readable, informative, often entertaining. Good bedside reading.

Field Guides

Freshwater Wetlands: A Guide to Common Indicator Plants of the Northeast by Dennis W. Magee. University of Massachusetts Press, Amherst. Hard cover \$20, soft cover \$8.95

Just about every small town has a wetlands commission these days, with a good deal of confusion over what is a wetland. This book helps define the limits. Keys and line drawings.

The Natural History of Wild Shrubs and Vines by Donald W. Stokes. Harper & Row, New York. \$16.95

Personalized low-key account of some traits and quirks of plants one is apt to encounter in a countryside walk. The naturalist author is a keen observer and gives a fuller dimension to plants than is provided in the floras.

Gardening Techniques

Crockett's Flower Garden by James Underwood Crockett. Little, Brown, Boston. Hard cover \$24.95, soft cover \$14.95

No gardening personality of recent years quite matches the late Mr. Crockett, known to millions through his TV series. This is his last book, based on the same month-to-month format as *Crockett's Victory Garden*. Plenty of sound advice.

Square Foot Gardening by Mel Bartholomew. Rodale Press, Emmaus, Pennsylvania. Hard cover \$13.95, soft cover \$9.95

The traditional row system in the vegetable garden is not the most efficient use of space on a small piece of land, nor is it especially attractive or easy to tend. The author suggests making small squares for different plants and putting boards between to walk on. Organic fertilizers, succession cropping.

Successful Cold-Climate Gardening by Lewis Hill. Stephen Greene Press, Brattleboro, Vermont. Soft cover \$9.95

Regional gardening books usually deal with the milder parts of the country, for most of the others are aimed more or less tacitly toward the northeastern quadrant, which is indeed a large area. The author, a Vermont nurseryman, has seen some really cold winters and emphasizes Zones 3 and 4 in this unpretentious commonsense guide. The emphasis is on edibles, but there is also a good section on ornamentals.

Indoors

The Commercial Greenhouse Handbook by James W. Boodley. Van Nostrand Reinhold, New York. \$24.95

First-rate text for anyone starting in the field, written by a veteran Cornell professor (and an originator of the soilless Cornell mix). Culture, propagation and types of container-grown crops are covered in some detail, also cut flowers.

The House Plant Expert by D.G. Hessayon. Scribner's, New York. Soft cover \$7.95

A surprising amount of cultural information on particular plants is presented in this concise book, which would be even more helpful if it had dropped the British names for products before jumping across the Atlantic. Color drawings of nursery-catalog quality.

Begonias: The Complete Reference Guide by Mildred L. Thompson and Edward J. Thompson. Times Books, New York. \$37.50

Normally the title "The Complete Guide" (in the same category as "All About . . .") is a put-off for experienced gardeners. However, in this case the authors have really done their homework and produced a thorough, very attractive, copiously illustrated work that adds much to our knowledge of a popular indoor (and sometimes outdoor) plant group. Use and culture for the various types are covered in considerable detail. First rate.

Introduction to *In Vitro* Propagation by D.F. Wetherell. Avery Publishing

Group, Wayne, New Jersey. \$7.95
A short text on tissue culture, intended for college students but of interest to the nurseryman and keen hobbyist who would like to know more about this form of propagation.

Japanese Gardens

Japanese Gardens: Design and Meaning by Mitchell Bring and Josse Wayembergh. McGraw-Hill, New York. \$23.50

Two architects depict ten kinds of Japanese gardens and include fairly detailed plans that should be of interest to fellow architects and keen laymen. China's influence on Japanese tradition is explained, and a final section discusses principles of design and construction details. Bibliography.

A Japanese Touch for Your Garden by Kiyoski Seike, Masanobu Kudo and David H. Engel. Harper & Row, New York. \$14.95

Westerners are sometimes intimidated by the symbolism and inner complexity of Japanese gardens. This is a simpler approach than most, a good introduction for those who do not want an encyclopedialike treatment. Attractively illustrated.

The Japanese Courtyard Garden: Landscapes for Small Spaces by Kanto Shigemori. Weatherhill, New York and Tokyo. \$150

The elaborate history of a type of Japanese garden, one which is now achieving a degree of popularity in the United States. The far-ranging text is complemented by 89 color photographs of 66 classic gardens of Japan. A handsome, in fact striking, volume which should be helpful to anyone about to begin a Japanese garden.

Landscape Design

Garden Art by Lorraine Marshall Burgess. Walker and Company, New York. \$25
Ideas for embellishment of the garden, through plants and architectural features. Numerous black and white photographs.

Landscape Design That Saves Energy by Anne Simon Moffat and Marc Schiler. William Morrow, New York. Hard

cover \$17.95, soft cover \$9.95
Properly sited plantings can help cut the fuel bill and still be attractive. Among several interesting tables included is one on tree densities (how much visible radiation is blocked by a species in full leaf).

Miscellaneous

The Oxford Encyclopedia of Trees of the World edited by Bayard Hora. Oxford University Press, New York. \$24.95

Elaborate, attractive volume by a group of British authors that should be of interest to the home dendrologist. Emphasis is on the cooler climates and on trees with some horticultural prominence. Color plates.

Medieval English Gardens by Teresa McLean. Viking Press, New York. \$25
Solid historical account of a little-known period of gardening. In addition to medicinal, these gardens contained the herb roberts, ox-eye daisies, cowslips and other plants of a more innocent age.

The Water Garden by Frances Perry. Van Nostrand Reinhold, New York. \$17.95
Apart from water-lilies and other "deep-water" ornamentals, pondside and bog plants are discussed in some detail by a prominent English horticulturist. There are also chapters on pool construction, accessories and the problems often encountered in water gardening.

The Art of the Plant World: The Great Botanical Illustrators by Martyn Rix. Overlook Press, (distributed by Viking,) New York. \$75.00

Scholarly, well-illustrated British treatment of botanical illustration from the 16th to the 20th century. Much attention is given to the history of exploration in China and Japan.

Plant Groups

American Rhododendron Hybrids by The American Rhododendron Society, Tigard, Oregon. Editor Meldon Kraxberger. \$8.50

The brief descriptions of registered cultivars will be especially useful to the collector.

Rhododendrons of China by American

Rhododendron Society and Rhododendron Species Foundation. Translated from the Chinese. Binford & Mort, Portland, Oregon. \$18

The Complete Book of Evergreens by K.A. Beckett. Van Nostrand Reinhold, New York. \$16.95

A surprising amount of information is contained in this concise volume which dwells especially on broad-leaved sorts. An English import, probably most helpful to southern and West Coast gardeners.

Growing Hardy Perennials by Kenneth A. Beckett. Croom Helm, London. £6.95
Succinct descriptions of several species in the leading genera, with propagation and cultural notes. A good complement to the well-known British works on perennials by Alan Bloom and Graham Thomas.

Combined Rose List 1981 by Beverly R. Dobson, 215 Harrison Road, Irvington, New York. Soft cover \$3.50

A valuable nursery-source list for those looking for the hard-to-find.

All About Orchids by Charles Marden Fitch. Doubleday, Garden City, New York. \$15.95

If there is one introductory book on orchids to have, this is probably it. Kinds, culture and propagation are well treated, and there is a good smattering of unusually sharp photographs, the author's own.

The Complete Book of Roses by Gerd Krussman. Timber Press, Portland, Oregon. \$50

The history of various roses, their classification, even chromosome numbers of species are discussed by a leading German grower in this posthumously published book. There is a section on modern cultivars, not all of which are available in the United States.

The Miniature Palms of Japan by Yoshihiro Okita and J. Leland Hollenberg. John Weatherhill, Inc., Salem, Massachusetts. \$19.95

Foliage plants are prized in Japan, where even the aspidistra is exalted. There are also many attractive cultivars of dwarf palms in the *Rhapis* genus which make distinctive container plants. See page 47.

Regional

Trees and Shrubs of the Southwestern Deserts by Lyman Benson and Robert A. Darrow. Third edition, revised and expanded. University of Arizona Press, Tucson. \$49.50

Extensive taxonomic work with keys that should be of help both to the student and keen amateur who wishes to sort out the less-common native plants. A standard reference.

Plants for Dry Climates by Mary Ross Duffield and Warren D. Jones. HP Books, Tucson, Arizona. Soft cover \$7.95

Unusually fine introduction to the plants, gardens and gardening techniques of the Southwest. Complements the preceding volume nicely.

Southern Living Garden Guide by Southern Living Magazine. Oxmoor House, Birmingham, Alabama. \$17.95

Question and answer format, covering a number of regional contingencies. For the new gardener.

Rock Gardening

Few American titles on this subject are available these days, although the best hardcover one, by H. Lincoln Foster, will soon be available in reprint. Three recent books are from overseas, written by horticulturists who are highly regarded in their own countries—England and Germany. Although these books are mildly useful to the American gardener who already knows what rock plants are hardy and available in his area, they are of no substantial help

to the beginner except for pretty pictures and a depiction of plant variety. The reader must also be aware of in the case of the Bloom volume a so-called American edition which has not really been edited for the American market. Recent arrivals:

Alpines for Your Garden by Alan Bloom. Floraprint, Chicago. \$14.95

Alpine Garden Plants by Will Ingwersen. Distributed by Sterling Publishing Co., New York. Hard cover \$12.95, soft cover \$6.95

Rock Gardens by Wilhelm Schacht. Universe Books, New York. \$17.50

Travel

Plant Hunting in Nepal by Roy Lancaster. Croom Helm Ltd., c/o Biblio Distributing Center, Totowa, New Jersey. \$19
Absorbing account of a 1971 expedition, in the classic mold of Reginald Farrer and E.H. Wilson. The author, one of England's most knowledgeable plantsmen, is also an unusually fine writer.

Kirstenbosch by Brian Rycroft. International Scholarly Book Services, Forest Grove, Oregon. \$47.50

This South African botanic garden is one of the most remarkable native plant gardens anywhere. It is well depicted in this tea-table volume by the garden's director with color photographs by Roy Ryan. Other attractive volumes on the rich South African flora available from the same distributor are R.O. Pearse's **Mountain Splendour** (\$37.50) and W.P.U. Jackson's **Wild Flowers to Table Mountain** (\$37.50) ❧

In Memoriam

It is with regret that we report the passing of Eva Melady, on October 12, 1981. Line drawings by her graced many issues of PLANTS & GARDENS over the years. Miss Melady was a kind, gentle person with a warm sense of humor that frequently shone through in her art, and she will be greatly missed by her many friends at the Brooklyn Botanic Garden and elsewhere.

NEW FERTILIZER PROCESS COULD CUT COSTS FOR NITROGEN FERTILIZATION

Adapted by William F. Munk

Reprinted from FOLIAGE DIGEST (Foliage Education and Research Foundation, Apopka, Florida) and ORNAMENTAL NEWS (Cooperative Extension Service, Cook College, Rutgers University—Essex County Cooperative, Extension Service)

A new fertilizer material soon to be available in either liquid or dry form will save energy, reduce nitrogen losses, and cut costs. The process, developed and patented by scientists with the Texas Agricultural Experiment Station and Texas A&M University, has other benefits; it guarantees the retention of a majority of the fertilizer in the soil and allows the universal use of the cheapest dry fertilizer, urea. The new process will allow broadcast application to substantially replace the more expensive process of band application in row crops.

Urea is cheap because it requires less natural gas in the manufacturing than any other process. A drawback in its use is that it is very volatile and it must be rapidly incorporated in the soil to prevent excessive loss. But the incorporation process increases cost of use to the producer. At present, losses of nitrogen from urea applied on the surface of the soil can run as high as 80 percent, with losses of 30 percent being quite common, according to the soil chemist who developed the new process.

Lower Cost

This form of fertilizer will significantly lower the costs of nitrogen fertilizer use by producers who must leave fertilizer on the soil surface until rain or irrigation carries the nitrogen into the soil. The new process uses calcium or magnesium nitrates or chlorides to stabilize volatile nitrogen fertilizers. In calcium-rich soils, potassium salts can be used to free calcium to stabilize nitrogen. In acid soils, the calcium or magnesium in the formulation will substitute for much of the normally applied lime. In lime-rich

soils it will help improve soil structure.

If fertilizer potassium is required for maximum crop production, the cost of eliminating ammonia loss is essentially the cost of combining urea with potassium and, in some cases, a small amount of calcium.

Inorganic nitrogen fertilizers such as ammonium nitrate, ammonium sulfate and the ammonium phosphates will also lose large amounts of ammonia if surface applied to lime rich soils but none in acid soils. But urea loses nitrogen in both types of soils because it is converted biologically to the volatile ammonium carbonate.

How It Works

The method of ammonium loss reduction consists principally of three reactions: 1) the capture and precipitation of the carbonate produced by nitrogen fertilizers, 2) the reduction of soil alkalinity (produced by formation of ammonium carbonate) by the calcium and magnesium salts, and 3) reduction in the rate of urea decomposition.

Urea, at 90°F, when left on the soil in the presence of calcium, remains to a large extent in the urea form for two to three weeks instead of the present one to two days with ordinary urea. If rain occurs or irrigation water is applied, the urea is rapidly moved into the soil and decomposes at the normal rate, but from within the soil no ammonia loss occurs.

The improved fertilizer formulation system is effective in all agricultural soil, at pH values from 5 to 9 and at temperatures above freezing. Ammonia losses have been effectively suppressed in clays, loams, and sands with only small differences in calcium required. ❀

PESTICIDES: SHELF LIFE AND STORAGE REQUIREMENTS

Charles Sacamano

Reprinted from *GROUNDS MAINTENANCE*, May, 1981

Pesticides used in the landscape are manufactured, formulated and packaged to exacting standards. They can break down in storage, however, especially under conditions of high temperature and humidity. Some pesticides can lose active ingredients through chemical decomposition or volatilization. Dry formulations can become caked and compacted; emulsifiable concentrates can lose their ability to form emulsions. Some pesticides become more toxic, flammable or explosive as they break down.

Pesticide formulations that contain low concentrations of active ingredients generally lose effectiveness faster than more concentrated forms. Sometimes a liquid pesticide develops gas as it deteriorates, making opening and handling containers quite hazardous. In time, the gas pressure may cause explosive rupture of the containers.

Certain pesticides have a characteristic odor. If this odor grows stronger in the storage area, it could indicate a leak, spill or improperly sealed container. It may also be a clue that the pesticide is deteriorating because the smell of some chemicals intensifies as they break down. If none of these problems are found, chemical odors can be reduced by installing an exhaust fan or lowering the temperature of the storage area.

Storage

Fewer problems occur with stored pesticides and the products have a longer shelf life if the storage area is cool, dry and out of direct sunlight. Protection from temperature extremes is important because heat or cold can shorten pesticide shelf life. At temperatures below freezing, some liquid formulations separate into their various components and lose effectiveness. High temperatures cause many pesticides

to volatilize or break down more rapidly. Extreme heat may also cause glass bottles to break or explode.

Other characteristics of a pesticide product that affect its shelf life are:

- The formulation (liquid concentrate, wettable powder, granules, etc.),
- The types of stabilizers and emulsifiers used,
- The chemical nature and stability of the material, and
- The type of container and its closure.

Small amounts of pesticides should be stored in a locked cupboard or storage cabinet out of the reach of children. Larger amounts require a locked room or shed that is well lighted and well ventilated, and constructed of fire-resistant materials. It should have a smooth, uncracked cement floor painted with a hard sealer to simplify cleanup of pesticide leaks and spills.

Pesticides that are packaged in paper or cardboard containers should be stored on shelves if there is any possibility of dampness on the floor. Separating volatile herbicides and other pesticides is a wise precaution against cross-contamination. Keep all corrosive chemicals in the proper containers to prevent leaks that might result in serious damage. Even the simple step of tightly closing lids and bungs on containers can help extend the shelf life of pesticides.

Containers

Pesticide containers (including fiber and metal drums, pails, cans, bottles, bags, boxes, overpacks and liners) have an important effect on storage and shelf life. If stored for long periods, these containers may eventually corrode, crack, break, tear or fail to seal properly. Also, the label may become illegible.

If a damaged container is found, transfer its contents to a clearly labeled overpack

Herbicides

<i>Bensulide</i> (Betasan)	Granules are stable. Emulsifiable liquids may crystallize below 42°F but crystals redissolve if stored or warmed at high temperatures.
<i>DCPA</i> (Dacthal)	Store in a dry place. Wettable powders are stable for at least 2 years under proper storage conditions.
<i>Dichlobenil</i> (Casoron)	Granules are stable for at least 2 years if tightly sealed and stored in a cool, dry place.
<i>Glyphosate</i> (Roundup)	Store above 10°F to keep from freezing, which results in crystals that settle to the bottom of the container. Do not store, mix or apply in galvanized steel or unlined steel containers.
<i>Simazine</i> (Princep)	Wettable powders and granules are stable for at least 2 years under normal conditions. It is nonflammable.
<i>Trifluralin</i> (Treflan)	If stored for long periods below 40°F, emulsifiable concentrate formulations may give poor weed control. Its flash point is 119°F, so do not store near a heat source. It is stable for at least 2 years with cool, dry storage.
<i>2,4-D</i>	Esters, amines and salts and their formulations vary in volatility, flammability and other properties. Follow label directions carefully.

Insecticides

<i>Carbaryl</i> (Sevin)	Repeated freezing/thawing cycles may decrease effectiveness of flowable formulations. Wettable powders are quite stable under normal storage conditions.
<i>Diazinon</i>	Use 4E within 6 months of opening the container. Do not store near a heat source. Keep lids tightly closed; keep granular materials and dusts dry.
<i>Dimethoate</i> (Cygon, Rebelate)	Liquid formulations should be stored above freezing temperatures. It is flammable, so keep away from heat and open flame. Its flash point range is 73° to 100°F.
<i>Malathion</i>	Wettable powders are stable for at least 2 years when stored properly. Do not store liquid formulations below 0°F. Keep away from heat sources.

Miticides

<i>Chlorobenzilate</i>	Keep emulsifiable solutions away from heat or open flame. Store at temperatures above 32°F.
<i>Dicofol</i> (Kelthane)	Wettable powders are stable under normal storage conditions.

Fungicides

<i>Benomyl</i>	It is nonflammable and stable for at least 2 years with proper storage. It decomposes if exposed to moisture; keep dry and tightly sealed.
<i>Captan</i>	It is stable for at least 2 years under normal storage conditions. Protect it from extreme heat.
<i>Dinocap</i> (Karathane)	Wettable dust formulations are stable under normal storage conditions. Do not store liquid formulations near heat or open flame.
<i>Folpet</i> (Phaltan)	Store in a cool, dry place. Protect it from excessive heat.
<i>Zineb</i>	It decomposes when exposed to moisture, heat or air. Flammable derivatives may be formed upon decomposition. Its shelf life is limited.

Fumigants

<i>Metam-sodium</i> (Vapam)	Do not store below 0°F. It crystallizes at lower temperatures. Warm or store at higher temperatures and mix to redissolve crystals and assure uniformity before use.
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container or to one that has held the same formulation. Do not tear open the tops of new bags or boxes of pesticides; use a sharp knife, and clean it each time a container is opened. Partially filled paper containers should be sealed with tape or staples.

Buying Suggestions

When you buy pesticides, date them and keep a current inventory of supplies. Avoid stockpiling; buy what you need, but not to excess. This eliminates waste and solves the problem of what to do with old materials.

Even with careful planning it is sometimes necessary to carry pesticide stocks over from one year to the next. Check dates of purchase at the beginning of each season and use the older materials first. To keep the label on a container intact and legible, cover it with transparent tape or lacquer.

If given proper storage, some pesticides may remain active for several years. However, storage conditions vary so widely that it is difficult to predict long-term shelf life for a pesticide. This is one reason most pesticides are not backed by the manufacturer if stored longer than two years. ❀

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2. Date of filing: **October 20, 1981**

3. Frequency of issue: **4 times a year May-Aug-Nov-Mar**

A. No. of issues published annually: **Four**

B. Annual subscription price: **\$5.00**

4. Complete mailing address of known office of publication: **Brooklyn Botanic Garden, 1000 Washington Ave., Brooklyn, New York 11225 Kings County**

5. Complete mailing address of the headquarters or general business offices of the publishers: **Brooklyn Botanic Garden, 1000 Washington Ave., Brooklyn, New York 11225**

6. Full names and complete mailing address of publisher, editor, and managing editor:

Publisher: **Brooklyn Botanic Garden, 1000 Washington Ave., Brooklyn, New York 11225**

Editor: **Assoc. Margaret E. B. Joyner & Guest Editors, Brooklyn Botanic Garden**

Managing Editor: **Frederick McGourty, Brooklyn Botanic Garden, 1000 Washington Avenue, Brooklyn, New York 11225.**

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